THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVIII. No. 1751.] LONDON, DECEMBER 1, 1896. [48TH YEAR. PRICE 6d.

TUBES AND FITTINGS
FOR
GAS, STEAM, WATER,
AND ALL PURPOSES,
ALSO
COILS OF EVERY SIZE AND SHAPE.

Apply to the Original Firm of
JOHN BROTHERTON
LIMITED,
Imperial Tube Works, Monmore Green,
WOLVERHAMPTON.
ESTABLISHED 1861.

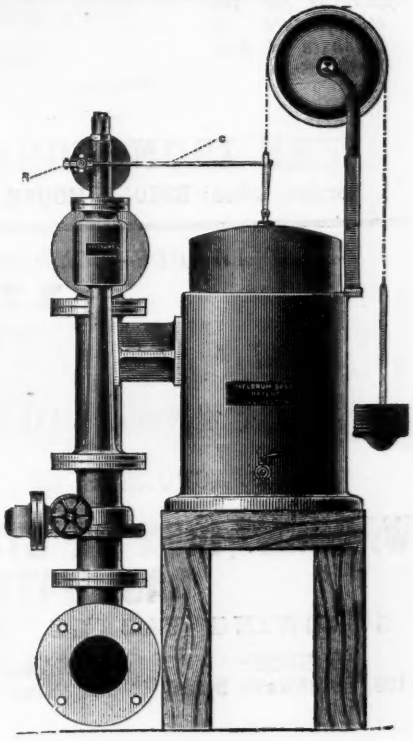
Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL
AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores, for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

CARLESS, CAPEL & LEONARD,
HOPE CHEMICAL WORKS, HACKNEY WICK, LONDON, N.E.,
And at Pharos Works, Hackney Wick.
NAPHTHA AND GASOLINE DISTILLERS AND PETROLEUM IMPORTERS,
Specially distil Carburine Spirit, specific gravity ·680, or of any other grade suitable for Enriching Gas; also Gas Oil best adapted for injecting into the Retorts, as in the Herring Process.
Importers of Petroleum for Carburetting Water Gas, or for Manufacturing Oil Gas. Distillers of Pentane, Petroleum Ether, and Naphtha for clearing the pipes of Naphthaline, &c.
Samples and Prices may be had on application.

MELDRUM'S Patent
Gas EXHAUSTER & GOVERNOR.
ABSOLUTELY AUTOMATIC.
REQUIRES NO ATTENTION WHATEVER.
Guaranteed perfectly steady Gauge, no matter how Steam Pressure may vary.
— HIGHEST REFERENCES GIVEN. —
MELDRUM BROS., Atlantic Works, City Road,
MANCHESTER.
Telegrams: "MELDRUM, MANCHESTER." National Telephone: No. 1674.



DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

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EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers and Contractors for the Erection of Gas-Works,

MANUFACTURERS OF IMPROVED GAS-EXHAUSTING APPARATUS, AND OF FISH AND SMITH'S PATENT (NO. 5108) OVERFLOW FOR REGULATING THE SEAL IN GAS-WASHERS, &c.

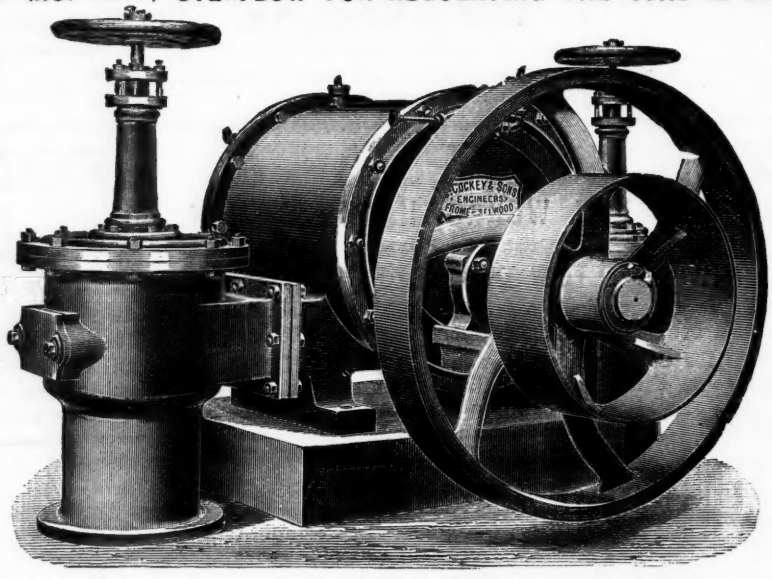
A Large Stock of Valves always on hand.

Lamp Columns; various patterns.

Wood Grids for Purifiers and Scrubbers.

Castings of every description.

Apparatus for the manufacture of Sulphate of Ammonia.



Experienced Retort-Setters constantly employed.

Lead Burning and Plumbing in all its Branches.

Gas-Fittings in great variety.

Brass Castings.

Patent Washers and Valves.

Boilers and Engines.

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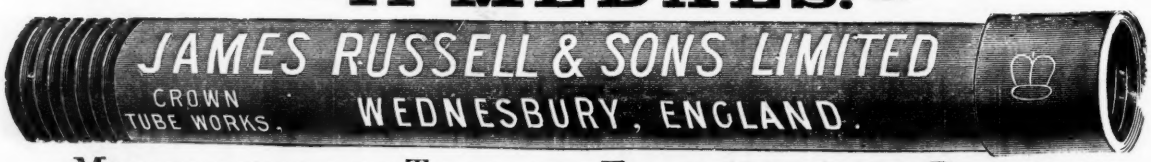
HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—



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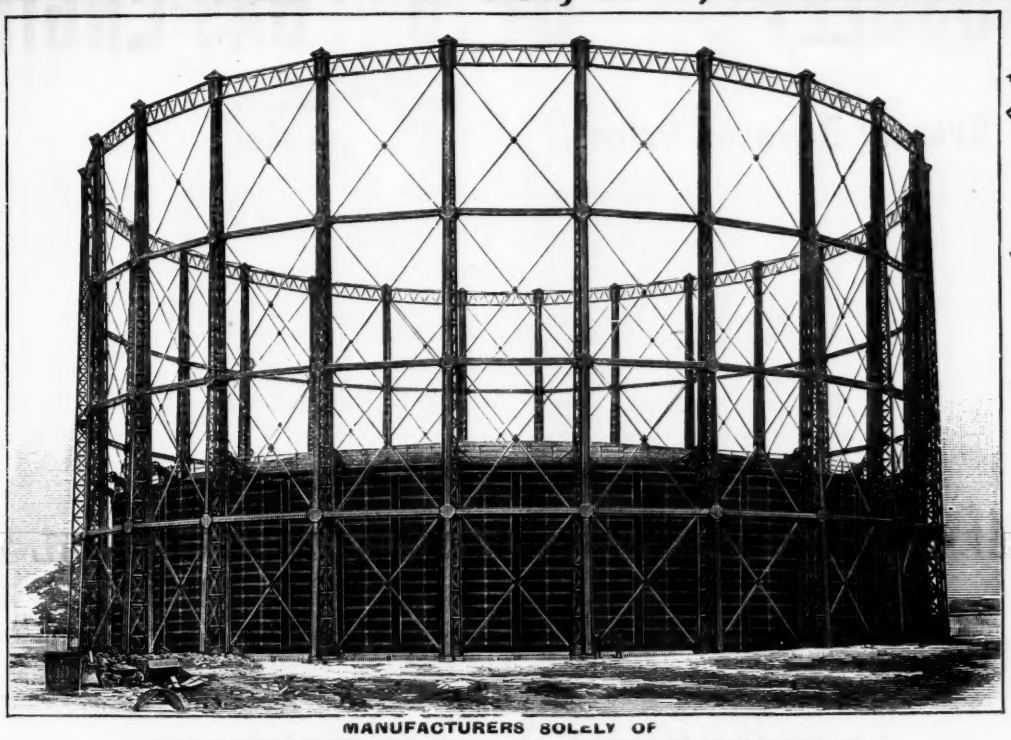
LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



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HUMPHREYS & GLASGOW'S

PATENT CARBURETTED WATER-GAS PLANT.

INSTALLATIONS have already been supplied, and are in operation at the following Gas-Works: COPENHAGEN, BELFAST, GLASGOW, BRUSSELS, SANTIAGO, SWANSEA, TOTTENHAM, LIVERPOOL, BRIGHTON, BATH, PRESTON, SOUTHPORT, NEW YORK, NEWBURGH (N.Y.), NEWBURGH (Second Contract), HOYLAKE; and are in course of erection at: BELFAST (Second Contract), EDINBURGH, TOTTENHAM, WINCHESTER, MANCHESTER, BRUSSELS (Second Contract), ST. JOSEPH (MO.), HOLYOKE (MASS.), SHANGHAI, STOCKTON, STOCKPORT, NORWICH, GUILDFORD, SYRACUSE, BORDENTOWN, LEA BRIDGE, COVENTRY.

All Particulars from Patentees: 9, VICTORIA STREET, LONDON, S.W.

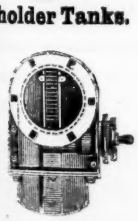
NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION OR Internal or External SCREWS of all sizes.

GASHOLDERS, AND Gasholder Tanks.



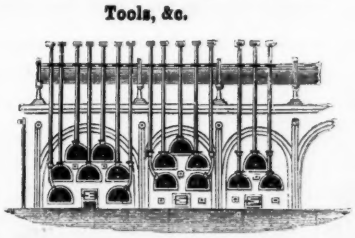
CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description,

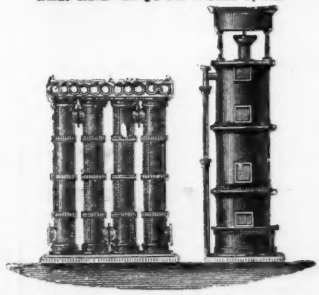
Iron Roofs, Columns, Girders, Floor Plates, Tools, &c.



WROUGHT AND CAST IRON

CONDENSERS, SCRUBBERS, & WASHERS,

TAR AND LIQUOR PUMPS, &c.



PATENT

CENTRE-VALVES

for working Purifiers,

Also Bye-Pass & Stop Valves

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS.

WOOD GRIDS.

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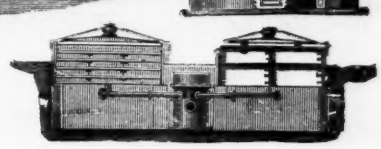


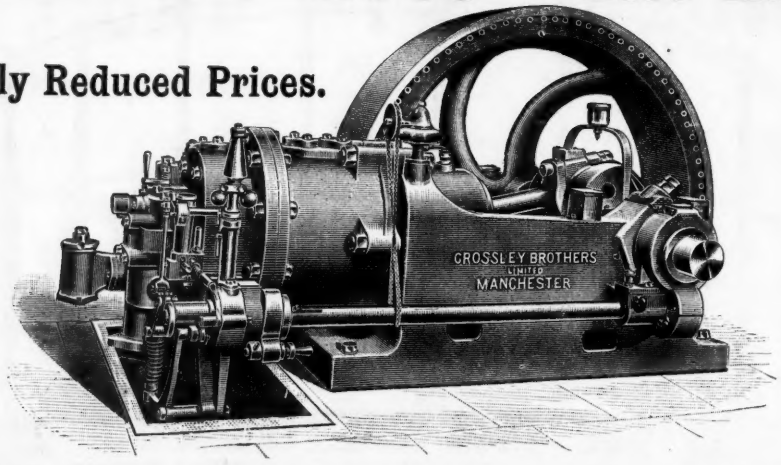
DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINES

Greatly Reduced Prices.



REPRESENTS NEW TYPE 40-HORSE POWER NOMINAL HIGH-SPEED ELECTRIC-LIGHT ENGINE.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

THE MOST ECONOMICAL GAS-FIRE IN THE MARKET.

The "SULTAN."

(Registered.)

The "Sultan" Fire is constructed on Scientific Principles, and embodies all the **latest Improvements** possible to be contained in a Gas-Fire. It is complete, with Internal Chambers for utilizing the Waste Heat after it leaves the Fire. The following are some of its advantages—

1. **Perfect Construction.**
2. **Excellence of Design.**
3. **First-class Finish.**
4. **Fitted with our New Perfected Burner.**

NOTE.—This is the Newest Design in the Market.

No.	Sizes.		Width of Fire. Inches.	Price, Ground, and Best Finished. EACH.	Price, Ground, and best Finished. Fitted with Tiled Sides EACH.
	Height. Inches.	Width. Inches.			
2141	29	20	8	42s. 6d.	55s.
2142	30½	22½	10	56s. 0d.	66s.
2143	31½	25½	13	65s. 0d.	76s.

SEND FOR NEW COMPLETE CATALOGUE, FREE BY POST.

The CANNON HOLLOW-WARE CO., Ltd.

DEEPFIELDS, near BILSTON, STAFFS.

LONDON SHOW-ROOMS: 58, HOLBORN VIADUCT, E.C.

INCANDESCENT GAS-LIGHT

(WELSBACH PATENTS).

Important Notice.

Large Reduction in Prices
From March 2, 1896,
Due to Colossal Sales,
And Universal Adoption of the System.

THE GREATLY REDUCED CONSUMPTION OF GAS
Covers the Initial Cost of the Burners in less than **SIX** Months.

The Prices have been REDUCED as follows:—

The Ordinary "C" Burner, price 6/6
The "C" Bye-Pass Burner, „ 7/6

Prices of other Patterns Reduced Proportionately.

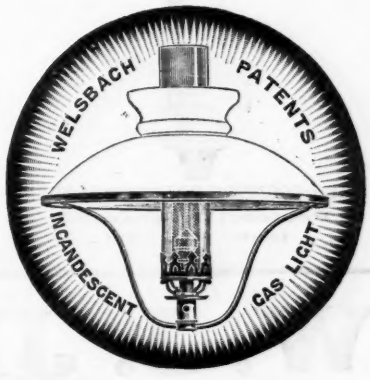
Special attention is called to

The "S" Bye-Pass Burner, price 7/6

which, with a consumption of 2¼ cubic feet of gas an hour, gives

A LIGHT OF 25 TO 30 CANDLE POWER.

This pattern is particularly recommended where it is desired to effect a large saving in gas rather than to effect a great increase in the light.



The attention of Gas Managers and Gas Engineers is called to this System of Lighting as one which tends to **Popularize the Use of Gas** as an Illuminant, owing to the following Advantages:—

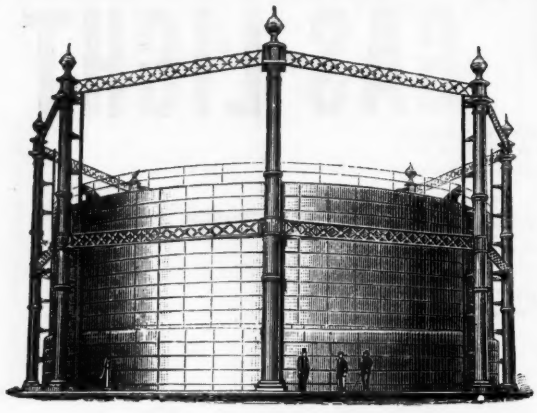
Economy in Consumption of Gas, combined with High Illuminating Efficiency.
Freedom from Smoke, Dirt, and Flickering.
Greatly Reduced Heat.
The combination of High Lighting Power with DURABILITY can only be obtained by The Welsbach System.

The "Lancet" Special Analytical and Sanitary Commission, in an exhaustive report, pronounces the "Incandescent Gas-Light System" to be the **Healthiest, Best, and most Economical System of Gas Lighting.**

Suitable for every purpose of **Inside and Outside Lighting.**

FOR FURTHER PARTICULARS, APPLY TO

THE INCANDESCENT GAS-LIGHT CO., LTD.,
Palmer Street, Westminster, London, S.W.



PORTER & CO.

GAS ENGINEERS,

MANUFACTURERS, IRONFOUNDERS, & CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

Telegraphic Address: "PORTER LINCOLN." National Telephone, No. 13.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

References to 600 Works already erected.

N.B.—All Communications to be addressed to the FIRM ONLY.

THE "COOMBE" DRAUGHT SCREEN.
Protection granted, 1896, No. 2075.

THE "COOMBE" DRAUGHT SCREEN FOR INCANDESCENT BURNERS.

ADVANTAGES.

1.—Prevents draughts of cold air from ascending the Chimney, and thereby lengthens the life of Chimney and Mantle.
2.—Prevents attempts to light spills, &c., in Bars and Restaurants, by which many Mantles are destroyed.
3.—Presents an ornamental appearance, which greatly adds to the beauty of the Burner.
4.—Prevents "Lighting-Back," and keeps out dust and dirt.

SOLD EVERYWHERE.

Wholesale of the Patentees,

ALFRED ARCULUS & CO., GLASS MANUFACTURERS, BIRMINGHAM.

"An Incandescent Burner without a Draught Screen is like a Man without a Collar."

W. J. JENKINS & CO.

GAS ENGINEERS AND IRONFOUNDERS,

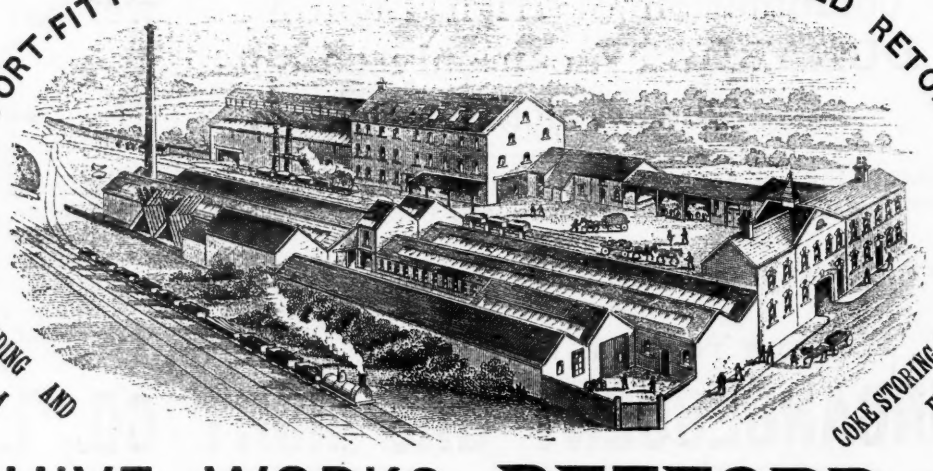
MAKERS OF ALL KINDS OF

PLANT AND MACHINERY FOR GAS-WORKS.

COAL-BREAKERS. COKE-SCREENS.

MOUTHPIECES. LIQUOR-TANKS.

RETORT-FITTINGS, REGENERATOR SETTINGS, INCLINED RETORTS.



COAL UNLOADING AND CONVEYING A SPECIALITY.

COKE STORING PLANT, ENGINES, EXHAUSTERS, VALVES.

BEEHIVE WORKS, **RETFORD,** NOTTS.

ARROL-FOULIS

PATENT AUTOMATIC MACHINERY

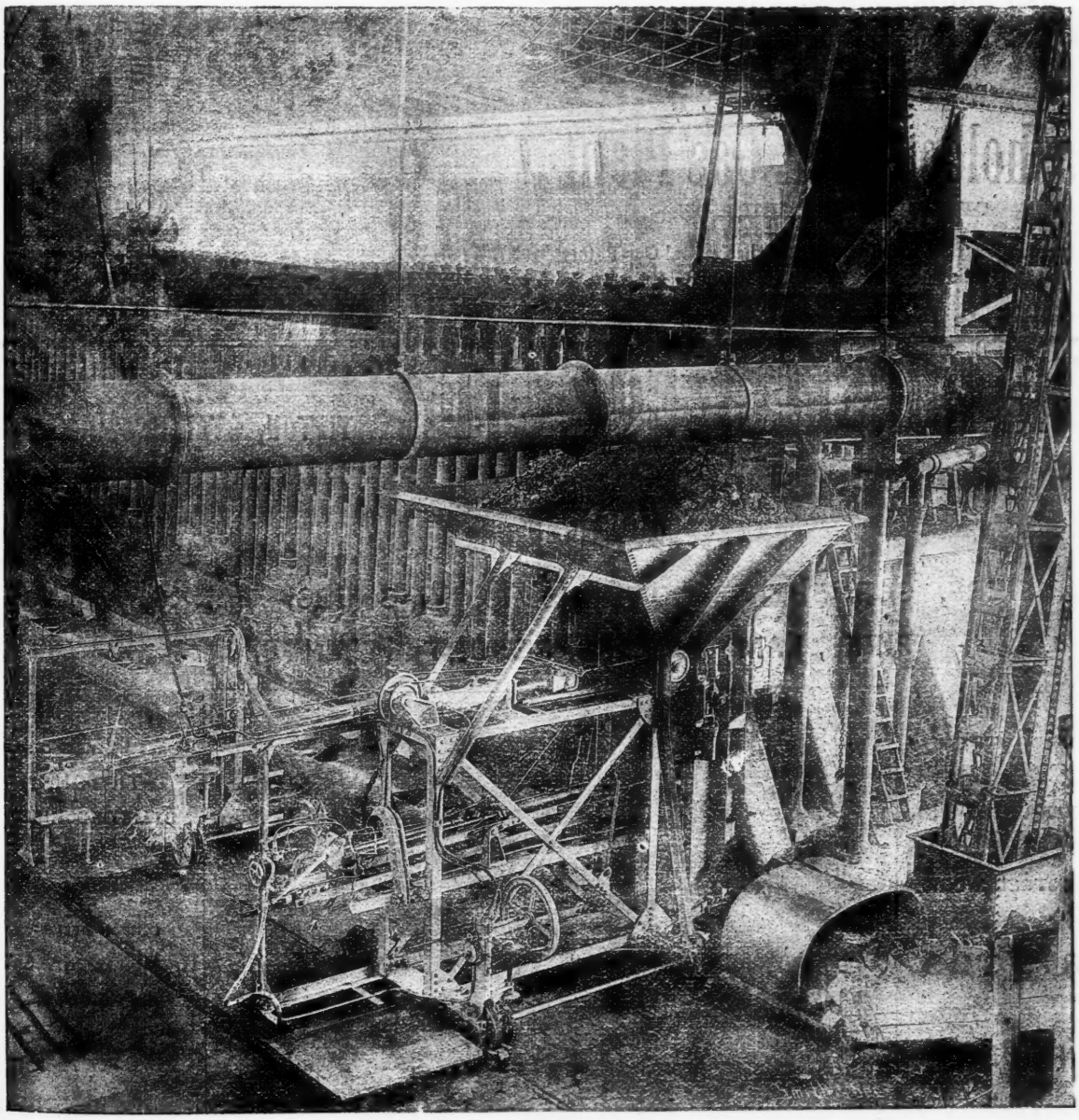
FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,

GLASGOW.

Plans and Estimates furnished on application.



The above engraving shows the interior of a Retort-House at the Tradeston Gas-Works, Glasgow, where the Machines have been at work since the beginning of 1893, drawing and charging **960 Retorts every 24 hours. 106 Drawing-Machines and 76 Charging-Machines are at work, or in course of construction.**

LATEST

Improvements in Sulphate of Ammonia Apparatus

COLSON'S PATENT)

EXTRACT FROM ENGINEER'S REPORT: "I can now obtain **60** Tons of Sulphate of Ammonia per week with 'Colson's' Still, using ONE Boiler, whereas, with my former continuous plant, TWO Boilers were required to produce **40** Tons per week."

EXTRACT FROM LETTER: "As regards the consumption of Lime, I may say that we work with **40** per cent. LESS than on the old system. Of the principle and workmanship of the Stills, I can speak very highly. When once working, we find them very silent, automatic, and requiring very little attention. As for the cleaning out of the Stills, we find they only require doing so once in Six Months; and this can be accomplished in **24** HOURS AGAINST **3** OR **4** DAYS with the old style of upright Stills." WILFRID WYLD, Bradford Corporation Chemical Works.

For Prices and Particulars, apply to the Sole Makers—

ASHMORE, BENSON, PEASE, & CO., Limited,
Gas-Works Contractors, STOCKTON-ON-TEES.

HANNA, DONALD, & WILSON,

(Established 1851),

GAS ENGINEERS & CONTRACTORS,

Abercorn Foundry and Abbey Works,

PAISLEY, N.B.,

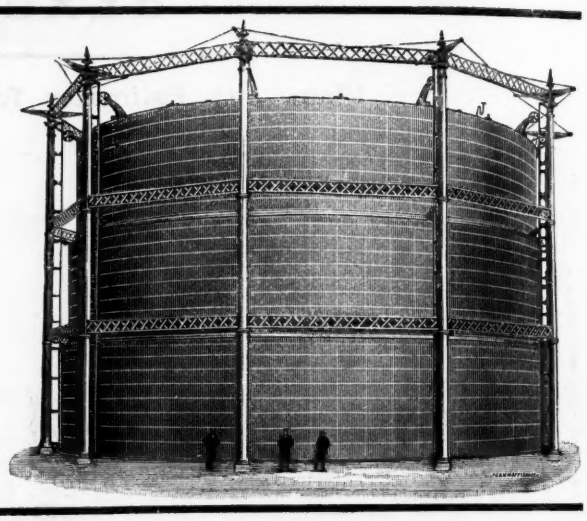
MAKERS OF

Gasholders and Gas Plant

OF EVERY DESCRIPTION.

Sole Agents for Scotland for the Automatic Coal-Gas Retort (Inclined System) Company, Limited.

Telegraphic Address: "Donald, Paisley."



THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE.

MAKERS OF

GASHOLDERS & GAS PLANT,

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES,

PIPES, LAMP PILLARS, RETORT-FITTINGS, Etc.

ALSO ALL KINDS OF

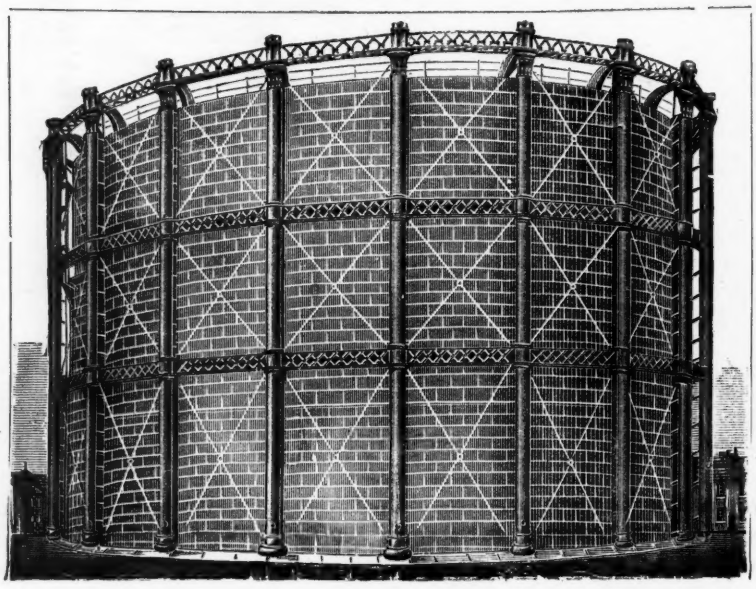
STRUCTURAL IRON

AND STEEL WORK.

BRIDGES,

ROOFS,

PIERS, ETC.



WORKS AND HEAD OFFICE:
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STAFFORDSHIRE.

LONDON OFFICE:
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WESTMINSTER.

TELEGRAPHIC ADDRESSES:
"HORSELEY, TIPTON."
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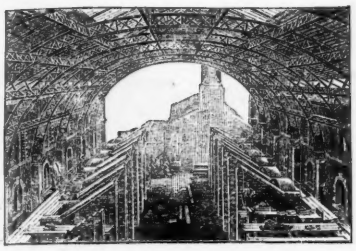
W. C. HOLMES & CO.

IRONFOUNDERS AND CONTRACTORS.

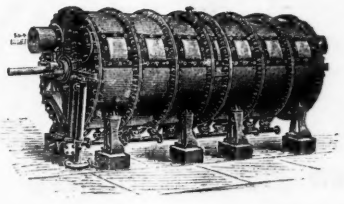


Makers of
GAS & CHEMICAL
PLANT.

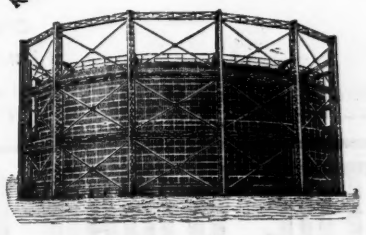
Telegrams:
"HOLMES, HUDDERSFIELD."

Improved
PATENT SCRUBBER-WASHERS,
All sizes,
From 50,000 to 5,000,000 Cubic Feet of Gas per day.
Results unrivalled. Send for Particulars and Prices.

MALLEABLE
and all Kinds of
CASTINGS.



GASHOLDERS of Improved Construction and of all Sizes.
ROOFS, BRIDGES, TANKS, GIRDERS.



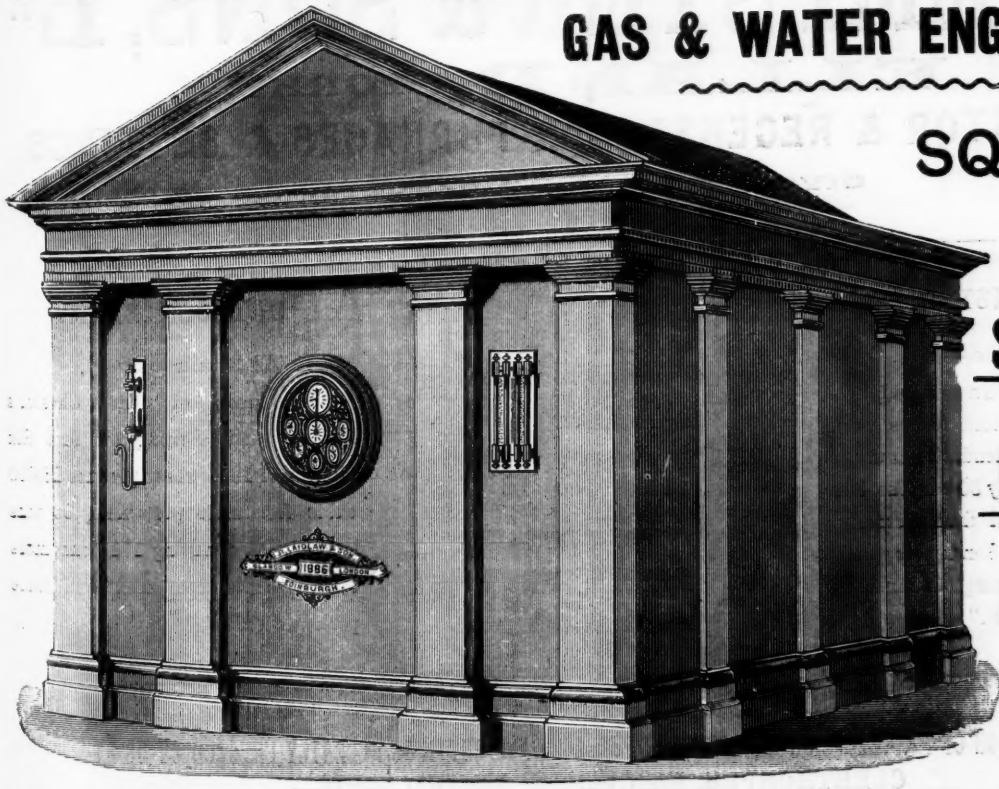
Improved
BYE-PASS and
CENTRE-VALVES,
GOVERNORS,
and METERS.

Rotary or Pump
EXHAUSTERS.

80, CANNON STREET, LONDON,
AND
WHITESTONE IRON WORKS, HUDDERSFIELD.

R. LAIDLAW & SON

GAS & WATER ENGINEERS.



SQUARE
(OR ROUND)
STATION
METERS
ALL SIZES.

SIMON SQUARE WORKS,
EDINBURGH. | ALLIANCE FOUNDRY,
GLASGOW. | 6, LITTLE BUSH LANE,
LONDON.

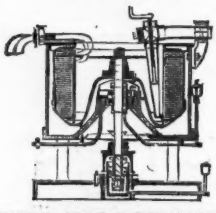
KIRKHAM, HULETT, & CHANDLER, LD.

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

MARSHALL'S PATENT COMBINED BATTERY CONDENSER AND SCRUBBER.

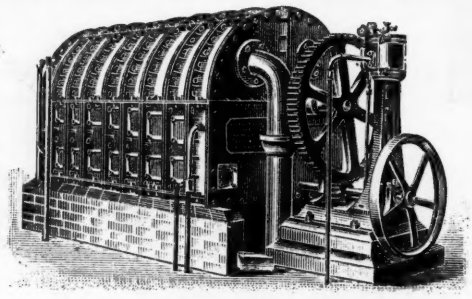
Extract from letter from Mr. Winstanley, of Coventry: 'The Condensers you erected for us have been in use some time, and are working very satisfactorily.'

BURMEISTER AND WAIN'S TAR-SEPARATOR.



EXTRACTS OVER 90 PER CENT. OF AMMONIACAL LIQUOR FROM TAR.

PATENT "STANDARD" WASHER-SCRUBBER.



OVER 530 MACHINES

In use and in course of Construction.

They extract all the Ammonia and a large proportion of Carbonic Acid and Sulphuretted Hydrogen.

BRUUN'S PATENT WATER SOFTENER

PREVENTS A'L "SCALE" AND SAVES FUEL.

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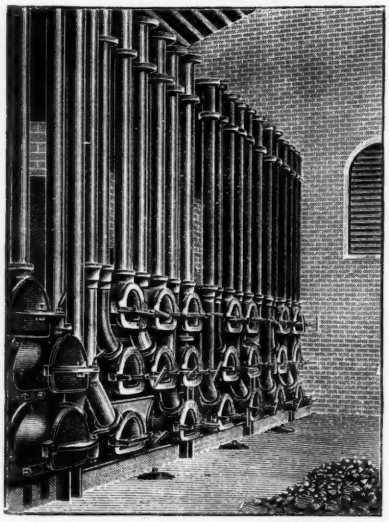

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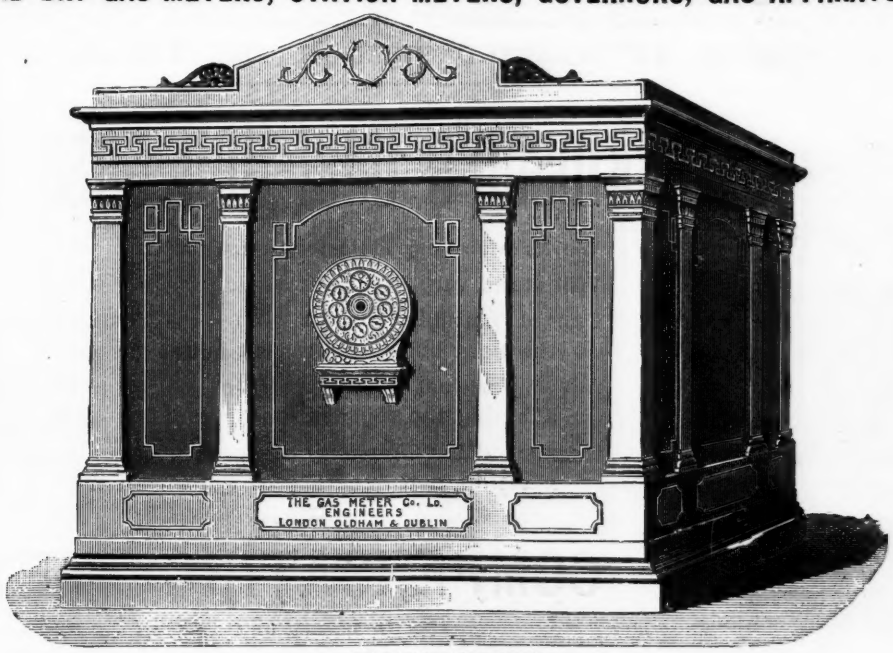

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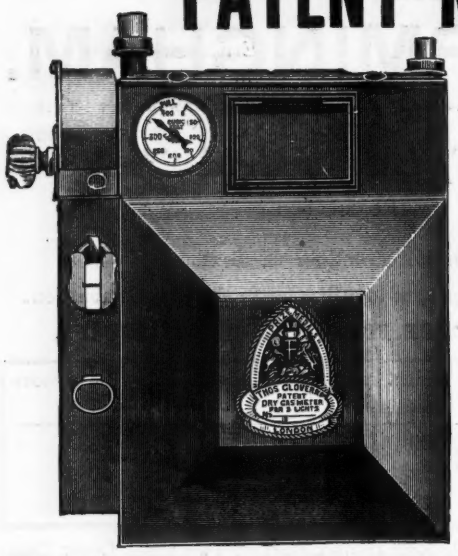

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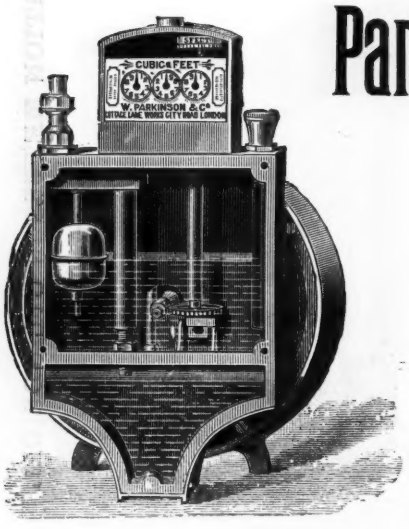

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[See also Advt. p. 1104.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EDITORIAL NOTES.

Papers at the Manchester District Institution Meeting.

AN ample programme was provided for Saturday's meeting of the Manchester District Institution of Gas Engineers, which was held at Bradford under the presidency of Mr. Isaac Carr, of Widnes. Mr. G. Ernest Stevenson read a paper on the cost of supplying light by gas and electricity respectively, based upon local data. Manchester has done very well in the electric lighting business, for reasons which may be commended to the particular study of all who are interested in the subject. The area of supply was picked, to begin with, out of the very heart of the city; and everybody knows the character of the centre of Manchester. No extensions have been made into second-rate or suburban districts; and street lighting has been rigorously left alone. The mere fact, vouched for by Mr. Stevenson, that the average consumption of current by the lamps in circuit works out to more than 20 units per annum, proves conclusively the very favourable character of the district. There is no such "load factor" to be found anywhere else in the kingdom. For reasons stated at the commencement of the paper, Mr. Stevenson has not attempted to solve the elusive problem of the cost of gas or electric lighting to the consumer, but has confined himself to the more manageable, and at the same time the fundamental, problem of the comparative cost of providing equal potentialities of lighting by the two methods. The net result is to show that the electric light costs 2·2 times that of Manchester gas, "all in." This figure, of course, does not express the possible saving to the consumer who uses gas instead of electric light, and goes the most economical way to work.

Mr. T. Newbigging contributed a valuable paper on the illuminating power of the gas supplied by statutory undertakings making annual returns to the Board of Trade, as compared with the prescriptions of the Acts of Parliament relating to the same undertakings. Some remarkable figures came out as the fruit of Mr. Newbigging's investigations into this subject; it being shown, among other things, that the excess illuminating power given to consumers beyond what they could legally claim, probably costs upwards of £200,000. From one point of view, this revelation might be regarded as showing that the gas "monopolists" of the United Kingdom are not the grasping traders they are sometimes represented as being by people who would hardly, in their own private concerns, give anybody a penny-farthing's worth for a penny. Mr. Newbigging rightly questioned, however, whether giving this excess of illuminating power is true liberality. An even more serious consideration touched upon by the author—very tenderly, as befitted the occasion and the place—was the irrationality of the differences exhibited by the parliamentary returns between the stated illuminating power of gas supplies in neighbouring districts. These differences would be troublesome enough if the returns which show them were reliable. But, unhappily, great and well-founded suspicion attaches to the statements of illuminating power supplied in many instances. And even if all the figures were given in good faith, the photometric practice upon which they presumably depend varies so irreconcilably in different places, that it is impossible to regard them as fairly comparable among themselves. These aspects of the question of the statutory and actual illuminating power of town's gas are familiar enough to gas managers; but it is doubtful how far the same knowledge has penetrated among town clerks, and it is quite certain that many voluble members of local authorities given to the cultivation of gas agitations are destitute of it.

Mr. T. N. Ritson, of Kendal, once more came to the rescue of sulphate of ammonia. He has made himself the pioneer of the troublesome and thankless cause of popularizing sulphate among agriculturists at first hand; and though he claims some success for his devoted efforts in this direction, the unquestioned falling off in the home consumption of this product naturally troubles him. He offers suggestions for increasing the demand for, and checking the evil of speculative dealings in sulphate. These are well meant and well considered; but we are not sanguine of their bearing much fruit. Sulphate is not a sufficiently important consideration to the largest

makers to render it incumbent upon them to do the best possible for it. While the active representatives of the greatest producers are officials and not men of business, sulphate, like everything else that passes through their hands, must take its chance and go as it will.

The "Engineer" Road Carriage Competition.

By way of comment upon the performances of "Motor "Day," our contemporary the "Engineer" has come out with a revised edition of the conditions of competition for the splendid prizes, amounting to 1100 guineas in all, which it is offering to the whole world, in the hope of creating an industry in mechanical road carriages worthy the name. Speaking honestly, this competition is no business of ours, inasmuch as there is no apparent prospect of a practicable coal-gas power road carriage being forthcoming by the 24th of May next, which is the date fixed for the reception of the competing vehicles at the Crystal Palace. All the same, we have noticed our contemporary's original offer in this connection; and it is simply doing justice to this public-spirited action to give the pending competition all possible prominence and encouragement. In all probability, if there should be in this expected collection a mechanically-driven road carriage worthy of a second glance, it will depend for its motive power upon some kind of gas-engine; and if there were such a thing as a rotary gas-motor to be had, the question would be finally settled. The first of the judges appointed to deal with the competition is Sir Frederick Bramwell; and he will prove a tough customer for the carriage builders and motor makers to encounter. He presided last Wednesday at the Society of Arts when Mr. W. Worby Beaumont, until very recently one of the Assistant Editors of the "Engineer," read a paper on "Recent Developments in "Mechanical Road Carriages." His comment on the paper was a declaration that "if he were a man of leisure, "he would make a servile model of Hancock's steam-"carriage, and, putting it on the streets, would ask the "engineers of to-day: 'What have you got to show better "'than that?'" This is Sir Frederick Bramwell all over; yet there is not another of the judges named who will see quicker than he what there is of good in the exhibits at the Crystal Palace. The judges, moreover, are not likely, without Sir Frederick Bramwell's guidance, to make the mistake of overvaluing such performances as those which made the last nine days' wonder along the London and Brighton road.

In view of the importance of the competition and of the consequences that may ensue upon the judges' decision, special precautions are taken to prevent disputes arising at the time or afterwards. The first prize, of 350 guineas, is to be awarded to "the best mechanically propelled "vehicle constructed to carry—including the driver—four "or more persons; the total weight, when fully loaded, "not exceeding two tons." Any method of propulsion other than muscular power may be employed, provided it is contained in the vehicle; and no petroleum is to be used, whether for the production of an explosive mixture, vapour, or fuel, that does not come under the description of ordinary lamp-oil. A supplementary class is opened for spirit motors. It is to be hoped that our contemporary's enterprise will not go unrewarded by the appearance of something better than has yet been seen upon the roads. No secret is made of the dissatisfaction felt at the aspect and performances of the cars that put in an appearance on the Brighton road on the 14th ult.; and it is tolerably certain that, unless great improvement is shown between now and next May, the "Engineer" prizes will not be given at all. Our contemporary believes that time will perfect the road carriage; and so do we. All experience shows that success in the design and construction of motive-power machines is only to be attained by prolonged endeavour; and this particular application will probably prove very tedious in the development. Meanwhile, the public may rest assured that there is not likely to be any more monopoly in the making of mechanical road carriages than there is in steam-launches—a reflection which should cause people to leave the present motor-car companies severely alone.

The Case of the Plumber.

Complaint is being gravely made in several trade journals that the plumber is becoming extinct. The old familiar "three-branch hand" of the small shops is no longer to be had everywhere for the asking, even by employers who are willing to pay what they consider high wages to competent men. Remembering what the gas industry has suffered at his hands in the past, it might be possible to bear, with resigned content, this announcement of the proximate disappearance of the "three-branch hand," if one could be sure that this usually incompetent workman was making way for a better tradesman. This, however, is not the case; and though there is not exactly a dearth of gas-fitters just yet, it is feared that the supply will not in the near future be equal to the demand. In part this is the old story of the reluctance of boys nowadays to learn a trade. It is very difficult to ascertain the real facts with any degree of statistical accuracy; but there seems to be ground for agreeing with the view of the "Ironmonger" that "the objections to ap-"prenticeship on the part of young men and their parents, "coupled with the absurd restrictions of many of the Trade "Unions as to the number of apprentices, are responsible "for the scarcity of really able workmen." Of men who pretend to be plumbers, or anything else, there is no lack; but these incompetents are not worth having at any price in a shop, and still less on a job outside. The immediate burden of this complaint is with the small employers and the jobbing shops. It is another exemplification of the working of the force that tends to concentrate business in a few large firms. Really competent workmen cannot afford to waste themselves in the little shops, where they would hardly be sure of their weekly wages, and employment must be precarious. The good men will get into the larger shops if they can; and the public are, for this reason, more and more preferring to send orders to the most important firms. There is a centrifugal action, to a small extent, accompanying this centripetal tendency; so that a number of little masters, mostly doing or pretending to do their own work, are continually starting for themselves on the strength of being "from Messrs. So-and-So's." As a rule, however, the public prefer going to head-quarters; and the day of the little master is passing away. This is really one of the justifications for the undertaking of house-fitting work by suppliers of gas.

The calls made upon the skilled tradesman are no longer of the same kind as those with which the old mechanics, contemporary with the millwrights, were well acquainted. Nowadays, a vast proportion of the work that was formerly done on the spot by hand is bought ready prepared for use. In the United States, a deliberate attempt is being made to abolish the skilled workman wherever possible. The organization of factories and the development of self-acting machinery are pushed to such lengths, in the land where the protection of native industry is a part of the national religion, that skill in the workman is being dispensed with over a wide range of industrial occupations. If the American manufacturer could have his way, there would be no workmen to share the benefits of the tariff with him. He would simply "press the button," and machinery, tended by a few girls, would "do the rest." Without stopping now to inquire whether or not this tendency is admirable, it may be observed that there is some work which can never be done in a factory; and plumbing is the type of this kind of work. Indeed, if modern civilization is to progress in the future along the lines it has taken in the past, the plumber will be more indispensable than ever—if such an expression may be permitted. If everything is going to be "laid on" to the modern residence, who is to do it if not the plumber? Indisputably, therefore, the future is with the order of tradesmen of whom the plumber is the prototype. Let us see to it that there is plenty of him, and of the right stamp. People will abuse the plumber until the end of time; but they will continue to send for him. Our Board Schools must not be allowed to squander the ratepayers' money in manufacturing poor commercial clerks out of material possessing the potentiality of yielding good plumbers, if the country at large is to continue to lead the world in the ways of material civilization.

The "Skulker's Button."

The outbreak last week of a strike of dock labourers at Hamburg has drawn attention to the recent proceedings of the wire-pullers of the International Federation of Ship, Dock, and River Workers, who have been busily engaged for some time past in preparing for one of those "universal "strikes" which have been so often ordered and yet have never come off. These gentry, having learnt by experience

that even dockers will not always obey their orders, have addressed themselves assiduously to the task of so organizing the forces of this description of labour that obedience to their behests might be better assured. One step taken with this object was to put all the army of dockers and 'longshore men into uniform—for does not discipline go with the "cloth" in every military system? It is true that in this case the uniform was cut down to the simplest possible expression. In point of fact, it consisted of a button, to be worn by all such as owned the sway of Mann, Wilson, Tillett, and Co. Nothing could, on the face of it, be less offensive than this. But even so the employers took alarm at the button, and the strike at the Salford docks last year was on the question of whether or not it should be worn. The employers saw in the button the overt sign of a conspiracy to wrest from them the conduct of their own business; and they would not have it displayed in such a manner as to distinguish unionist from free labour. Later developments of the Trade Union policy gave a sinister meaning to the button. The leaders were some time ago afraid to commit themselves to advising a strike; but they counselled their dupes to try a game which was called "ca' canny," and meant doing just as little work as possible for their money. It was, in short, a forcing of the well-known principle of the "Union stroke" to its farthest limit, and was promptly detected by the employers. With the love of plain language which usually shows itself in the British employer in the same measure as the British workman takes to the use of euphemistic terms, this notable policy of "ca' canny" was promptly denounced by the paymasters as "skulking;" and as the button made its appearance about the same time, this adornment was forthwith styled the "skulker's button." These things greatly annoyed the men of the federation; and Messrs. Mann, Wilson, and Co. have not profited much either by their button or their policy. It remains to be seen what will be the outcome of this Hamburg affair. Of course, Mr. Mann has betaken himself to the scene of action, and equally of course he has been arrested by the minions of the paternal Government of Germany, and sent back to England. The cheap martyrdom of an agitator or two is not a matter of moment to anybody—not even to the martyr himself. But the results of a general strike of dock labourers at all home and the nearest Continental ports would be remarkable and highly inconvenient—especially to the strikers.

The Parliamentary Notices for Next Session.

In another column is given a complete list of parliamentary notices referring to gas and water supply published in the November "Gazettes." These notices are very numerous this year, promising greater activity than usual in the Committee-rooms devoted to this branch of Private Bill business. There are not, however, any gas measures of first-class importance in the list. The South Metropolitan application has already been mentioned in these columns; and no other London or Suburban Gas Company are going to Parliament this year. On the whole, the promised Gas Bills will be of the miscellaneous order; and though some of them may be expected to arouse smart opposition, there is no ground for supposing that the coming session will be made memorable by a great gas fight. The Dublin Corporation are, of course, coming to Parliament again; but in their case discretion has at length become the better part of valour, and they are going to leave the Gas Company alone for the time being. "For "this relief, much thanks!" It is satisfactory to see that the statutory gas industry continues to grow, and to need more money and room for its development in every part of the kingdom. Several limited Companies are seeking the protection of the statutory powers, which is as it should be, though there is plenty of scope for a good deal more of the same practical wisdom in gas-works administration. A number of gas undertakings are also taking advantage of the Gas and Water Works Facilities Act; but here again much more might be done. British Gas Companies are not so alive as they should be to the benefits obtainable under this statute.

The Award in the Dunfermline Arbitration.—It will be seen by our Scotch Correspondent's "Notes" that the award has been made in the Dunfermline arbitration. The total price the Corporation will pay will be a little over £96,000; and the costs will bring this amount up to rather more than £100,000.

WATER AND SANITARY AFFAIRS.

A speech by Lord James of Hereford, at the annual meeting of the London Municipal Society last week, might be expected to throw some light on the intentions of the Government with regard to the Metropolitan Water Supply. We find the organ of the Progressive party in the County Council indulging in a peculiar interpretation of the speech, whereby it says: "Lord James had no "encouragement to give the Moderates on the water "question." It is certain that he offered no encouragement to the Progressives; for nothing that he said favoured the idea that the County Council should have possession of the water supply. But it is asserted that in respect to this matter Lord James "held out no hope of legislation "from the Government." We do not so read his Lordship's remarks. He commenced that part of his speech by avowing that "with regard to the London Water "Question, he could not say what would be the action "of the Government in the coming session." He disclaimed any intention of discussing the merits of the East London question; but he recognized the fact that the incidents in that quarter "had quickened public inte-"rest," and had also "called attention to the necessity of "the good government of London in respect to its water "supply." This can hardly imply that, in the opinion of the Government, things should be left as they are. There is considered to be a "necessity" for something more. In connection with this quickened public interest, Lord James said there was "a feeling that there should be some "controlling power that should see authoritatively to the "full, complete, and pure supply of water to London." The reference to "control" is probably significant; and we meet with it again where his Lordship says: "No one had "suggested that the Government should become the con-"trolling authority for the water supply in London." Lord James then went on to state that the Government not only took a "continued interest" in the question, but "were doing their utmost to place in the hands of the "proper authorities the power to consider and deal with "the interests of the ratepayers of London." Finally, he "hoped they would find a solution of the question which "would be satisfactory to the public interest."

Such observations as these from the lips of Lord James, necessarily characterized by a certain degree of Ministerial caution, do not admit of the inference that the Government have adopted a policy of inaction in respect to the water question. On the contrary, they are "doing their "utmost" towards effecting a solution of the problem. The allusion to "the proper authorities" clearly excludes the idea of the County Council being constituted the one supreme power with regard to the water supply; and at the same time it agrees with the principle that the outer areas are to be comprehended in the scheme. Immediate purchase is not shadowed forth in the remarks by Lord James. "Control" is clearly involved, and "authorities" are invoked. We presume that his Lordship was referring to the late Water Board Bill when he said: "What the "Government had endeavoured to do was to compose "conflicting interests." It is at this point that a serious difficulty presents itself. Mr. Boulnois, as we mentioned last week, has argued that if the Government bring in a scheme giving preponderance to the London County Council, there will be very little chance of the Bill passing. If such preponderance is not given, the Council will inevitably oppose the Bill to the utmost. Such opposition, however, may not be fatal; for it was foiled on the question of the East London Company's Bill in 1894. But one thing has become clearer now than it has ever been—that the transfer of the water undertakings to a public authority, let that authority be what it may, is not likely to make the water cheaper or the rates lighter. This is a consideration which is of especial force against the Purchase Bills of the County Council, and will only just allow of a scheme of control. Such a scheme the Government may provide; and, if they do, it is possible they may carry it, though it would not be very difficult to show that even a system of control may involve much increased expense, and confer a doubtful advantage. By a notice of motion entered on the *agenda* of the County Council for to-day, it would seem that Sir John Lubbock still entertains some

hope of arresting the progress of the Purchase Bills, and substituting a policy in favour of "a well-considered "system of control of the Water Companies."

Two Bills emanating from the Metropolitan Water Companies are coming before Parliament in the ensuing session. The County Council may indulge in the luxury of opposing these measures; but the Legislature must have learned by this time that the Council is far from being a safe guide in matters relating to the water supply of London. Both Bills are clearly designed to extend the water supply, and to secure its maintenance. The Bill of which the New River Company have given notice proposes an extensive series of works, including aqueducts or lines of pipes leading off from the Staines reservoirs aqueduct, so as to connect that system with new subsiding reservoirs, filter-beds, and a pumping-station in the parishes of Hanworth and Sunbury. From the pumping-station thus to be constructed, the water will be led off to an equalizing reservoir and pumping-sation in the parish of Willesden, and finally to a new service reservoir and pumping-station at Finchley and Hornsey. Subsidiary lines of pipes will be laid in various localities. A portion of Hounslow Heath will be traversed by the intended works; but the surface of the ground will be afterwards restored. The Company seek power to appropriate to the projected works any capital which they may not require for the purposes for which it was originally authorized. It is also proposed to raise further money in order to carry out the works now projected. Some of the provisions of the Staines Reservoirs Act are possibly to be varied, and section 69 is especially named, so as to enable the Company and the Staines Reservoirs Joint Committee to enter into agreements and arrangements with reference to the taking of water by the Company from the reservoirs of the Joint Committee by means of the intended works. The entire scheme appears to be a natural sequel to the Staines Reservoirs Act, so far as relates to the area dependent on a supply from the New River Company.

The Bill to be promoted by the East London Company proposes the construction of new storage reservoirs, with the requisite aqueducts and other adjuncts, in the counties of Middlesex and Essex. There is to be the abstraction and diversion of waters from the River Lea and certain streams. The two reservoirs which are included in the intended works, together with four cuts, render it necessary that certain common lands should be taken. One reservoir thus requires 42, and the other 50 acres. The area to be appropriated consisted of marsh land in the neighbourhood of Chingford and Tottenham. For the cuts, rather less than 7 acres in all of common land will be wanted. The entire area of one reservoir will be 103 acres; and of the other, 115 acres. Together, there are four aqueducts, conduits, or cuts, and two communications consisting of a conduit or line of pipes. The total length of the four will be 3550 yards; and of the two, 200 yards. An aqueduct or cut of 1940 yards, included in the foregoing, is a diversion of the River Lea, commencing in the bed of the river in the parish of Chingford, and passing through the parish of Edmonton, terminating where it re-enters the river at Stonebridge Lock, in the parish of Tottenham. The next in magnitude is an aqueduct or cut 920 yards in length, connecting the Chingford Mill stream with one of the intended reservoirs. The Company seek power to raise further capital by means of debenture stock. From this source, the cost of obtaining the Act is to be defrayed, as well as the general expense of carrying out the works; these being described as designed by the Company for the purpose of "fulfilling their statutory obligations relating "to the supply of water or otherwise, and meeting the "increased demand for water within their existing limits "of supply." We may hope that Parliament, having laid certain obligations upon the Company, will thus facilitate their fulfilment.

Frank Wright's Prepayment Gas-Meter.—We learn that some very important improvements are being made in the mechanism of the above-named meter; and, so far as the experiments have gone, the results have been highly satisfactory. The Directors of the Company formed to introduce the meter have been working assiduously to perfect the appliance; and they will shortly be in a position to place it upon the market. Mr. Frank Wright has left the Board, and has ceased to have any connection with the undertaking.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1089.)

A VERY uninteresting week was the one just concluded on the Stock Exchange. Business in general kept very quiet; and the tendency in almost every market showed pronounced dulness. Prices went down accordingly; but not to any great extent. A marked contrast was presented by Consols, which had a smart rise aided by the state of the Money Market. The settlement did not develop anything startling; but it put some speculative operators in a tight corner. The demand for money in the Stock Exchange was not great; and the general aspect at present does not seem to foreshadow immediate tightness. Business in the Gas Market was decidedly quieter than it had been for the previous week or two; and prices of almost every description were inclined to be easier. For several months past, Gas stocks have been bought by the public with great avidity; and naturally the time arrives when a condition of glut is attained, and a pause is necessary before the appetite revives. Quotations, therefore, have almost all moved down. In Gaslights, the "A" opened at 318, but at once began to develop a little weakness—three points lower being the figure on Tuesday. At this point, however, it stood steady; and the closing mark on Saturday was 316. A fair amount of business was done in the secured issues; and with the exception of the 6 per cent. debenture, they held their positions very well. Transactions in South Metropolitan were very moderate; and prices were moderate too. There was more doing in Commercials; stock changing hands at about middle figures. The Suburban and Provincial Companies were almost completely stagnant; hardly a transaction being effected all the week, and quotations undergoing no change. The Crystal Palace Gas Company are offering £20,000 of stock at 135. At the rate of the last dividend, this price returns £3 17s. 9d. for money, which ought to be good enough as times go. The Continental division was weaker. A good bit of Imperial changed hands; figures shrinking a little with almost every deal, and closing without any sign of recovery. Union also had a fall; but European was very quiet, and unchanged. Among the rest, there was a further rally in Melbourne bonds; and of the two Argentines, Belgrano advanced, while Buenos Ayres receded. Business in the Water Companies showed about its average quietude. East London and Grand Junction had an 8 per cent. rally; but Southwark and West Middlesex were rather easier.

The daily operations were: Business in Gas was decidedly quiet on the opening day; and the tendency was dull and weak. Gaslight "A" fell 1; ditto 6 per cent. debenture, 2; Imperial, 2; and Buenos Ayres debenture, 1. But Melbourne rose 2. Southwark Water dropped 2. Tuesday was more active; but prices continued to fall. Continental Union lost 3; and Gaslight "A," 2. The tendency on Wednesday was much the same. Continental Union fell 3 more; but Belgrano debenture rose 2. In Water, East London gained 8; and Grand Junction, 2. On Thursday, prices were steady; and quotations for Gas did not move. In Water, Grand Junction improved 2 more; but West Middlesex fell 1. Business in Gas on Friday was very moderate; and the only change was a fall of ¼ in Buenos Ayres. Saturday was as quiet as usual; and quotations closed without further variation.

ELECTRIC LIGHTING MEMORANDA.

A Motor-Car Failure and a Trolley-Wire Catastrophe—The Truth about Redfern, New South Wales—The Electric Lighting Industry in Australia.

THOUGH nothing definite has been done in regard to motor cars during the past week, something has transpired which will not improve the prospects of electric traction. After a tremendous amount of journalistic trumpeting, on Saturday week the London Electric Omnibus Company actually put on the streets one of their new vehicles, constructed on Mr. Radcliffe Ward's system. At least, the omnibus was brought somehow to the scene of the start of the motor cars the previous Saturday, and a number of people got into it. It then crawled off into the next street, where it got on the wrong side of the road and refused to budge another inch. Looking extremely annoyed, and not a little foolish, the passengers and those responsible for the behaviour of the machine got down amid the sarcastic remarks of the cabmen and street loafers whom curiosity drew to the scene of inaction; and if, as is probable, there was an inaugural lunch arranged for the company, it must have been eaten under most depressing conditions. Naturally, the responsible gentlemen had an explanation of the untoward occurrence to offer, which the representatives of the Press seem to have accepted with becoming gravity. Somebody had been tampering with the electric connections—maliciously, of course, because the same thing had happened before. It is true that the story is not a new one, recalling as it does the events of the early exploitation of secondary batteries for the same object. But the striking feature of all these malicious interferences with the secret arrangements of accumulator cars is their peculiarly

deadly character. It takes days, weeks—nay, years to make good damages of this character; and an accumulator car that has once suffered injury in this way is rarely seen again. To put it as mildly as possible, this was a bad beginning for the Electric Omnibus Company. Another occurrence reported in the daily papers is of a kind to give pause to those local authorities who are inclined to think the trolley wire not so black as it is generally painted. At Tourcoing, in France, the town is wired according to the system of electric power distribution which many people seem desirous of seeing generally introduced into this country; and recently a boiler measuring 15 feet in height was being conveyed through the streets on a truck drawn by sixteen horses. Two men were stationed on the car, keeping the overhead wires clear of the boiler. On coming to a railway arch, the men accidentally allowed the wires to come into momentary contact with the boiler. The effect was terrible—the current instantaneously flashing through the load and along the chain traces of the team. All the horses were struck down, several being killed outright and horribly burnt. The men in charge also received violent shocks, from the effects of which some of them are not expected to recover.

On the 8th of September we discussed in this column some statements derived from the "Electrician" with reference to the condition and prospects of electric lighting in Australia. Special mention was made on that occasion of the electric lighting of Redfern, which was supposed to be a great success. We complained at the time that while the information supplied in regard to this example of Australian electrical engineering went into minute particulars concerning the dimensions of the chimney-shafts, and similar thrilling matters, there was not enough said about the economical and other fruits of the enterprise. We have just received a piece of information originally given in the "South Australian Advertiser," which exactly supplies this deficiency. It is a report of certain proceedings at a conference of the mayors of twenty-four suburban municipalities with reference to street lighting. The Mayor of Redfern was present; and as this borough was supposed to be in the forefront in respect of lighting, its Chief Magistrate was asked to favour the conference with a statement of his experience of the subject. He replied as follows: "I have sufficient knowledge of what has taken place in Redfern to be able to give you good advice. If I might put that advice in the fewest possible words, it would be this: Make the best terms you can with the gas company. If I was your paid expert, I would not advise you, in the present stage of electric light, to go in for it. Redfern is a compact borough. There is but little vacant ground. Our lights are nominally 25-candle power, and gas are supposed to be only 16; but I am by no means sure that the penetrating power of our 25 candles is greater than that of the ordinary gas-lamp. Electric lighting is a most troublesome business to undertake, and one which should never be undertaken by a body of Aldermen." This is a very instructive supplement to the statements we dealt with in September.

The same correspondent who has kindly supplied us with the foregoing information has also sent particulars enabling one to see how the electric lighting industry is faring in other parts of the Australian continent. It appears that in Melbourne there are two electric lighting companies in existence. The 1894 report of the Directors of one of these flattered the proprietors with the observation that the returns "compare most favourably in every way with those of the leading electric lighting companies throughout the world." This is no compliment to the industry at large, inasmuch as the balance-sheet of the Company showed a capital expenditure of £68,543, made up as follows: Share capital paid-up, £20,859; owing to sundry creditors, £6684; borrowed on mortgage, £41,000. This latter feature of the capital account is a true bit of Australian financing. The working account for the same period shows a balance to the credit of profit and loss of £3058, out of which £2847 has to be spent; leaving the magnificent balance of £211 to pay a dividend on the ordinary shares. Moreover, no provision is made in these accounts for depreciation, which "word of fear" the Antipodean electrical engineer evidently dreads as heartily as his brother at home. By June last the capital outlay had become £69,911, and the profit balance available for dividend has risen to £606 for the year. A good illustration of the way in which electric lighting enterprise hangs fire in Australia is afforded by the history of a concern started in Adelaide in January, 1895, under the name of the South Australian Electric Light and Power Company. More than twelve months ago, this Company made a contract with the Local Authority to light the streets of Port Adelaide. But it was found impossible to raise any capital in the colony; so in March last it was announced locally that the Engineer of the Company was going to England to complete the necessary financial arrangements for carrying out so big a job. The Port Adelaide Town Council waited until some time after the traditional year and a day had expired, and then they passed a resolution calling upon the Company to carry out their contract without further delay. This spirited action evoked from the Company a statement that it had been found necessary to take "other steps" with regard to the financial operations; and it was further declared that "arrangements are now being made with regard to same," which would enable the Board to give the Town Council a satisfactory reply before the end of the month. Nothing, however, has been done. Thus the electric lighting industry still flourishes in Australia, where there would appear to be, on the face of circumstances, every inducement for the public to patronize this system of lighting in preference to all others. If anybody will supply an explanation of these facts other than that which they offer to a coldly critical eye, we shall be glad to examine it, and to give it full publicity.

A BELGIAN VIEW OF SUNDAY LABOUR IN ENGLAND.

In a recent issue of the "Journal," we discussed editorially the substance of a "Times" paragraph reporting the result of an inquiry ordered by the Belgian Government into the custom of Sunday observance in England. We then expressed a desire to see the original report, stated to have been presented to the Belgian Minister of Industry and Labour by Dr. Vercruysse, the Commissioner appointed to conduct the inquiry; and it is with much satisfaction that we are now able to announce that our wish has been gratified through the kindness of Dr. Vercruysse himself, who has sent us a copy of his official book on the subject, for which courteous act we have to tender him our best thanks. The subject of Dr. Vercruysse's investigations is one in which, we are able to assure him, Englishmen of all orders and ranks take a deep interest, the intensity of which is not to be gauged by the indications offered by those organizations that have taken the British Sunday under their protection. It is entirely correct to say that more has been done for Sunday observance by quiet action on the part of unofficial citizens than can be credited to all the fussy people who busy themselves over the cause, and not rarely make themselves more ridiculous than useful in this connection. In the particular case of the gas industry, great progress has been made—especially by the private companies—in restoring to gas workers the Sunday rest with which the exigencies of the work in the early days of the industry were commonly supposed to be inconsistent. Readers of the "Journal" will therefore be specially concerned to know what facts Dr. Vercruysse has been able to collect, and what opinions he has formed, respecting this peculiarly British institution.

To begin with, it must be freely admitted that to set a single foreigner, however able and zealous, the task of collecting reliable and comprehensive information concerning such a matter, is to lay upon the inquirer a heavy responsibility and an arduous labour. Pressed for time, destitute of every means of compelling testimony, and not knowing how to set about the work or whom to ask for assistance, it is almost as much as can be expected of such an inquirer if he escapes absolute failure in his mission. Dr. Vercruysse has done much better than this. As a lawyer, his first idea was to look up the English law on the subject; and as the result he claims to have made an entirely novel study of the history of Sunday observance legislation, which helps to elucidate the apparent contradictions that cloud the question as it presented itself to the perceptions of the most competent of his interlocutors. Consequently, his first chapter gives a summary of ancient English legislation, classed as "religious," directed to secure, under pains and penalties, the rigorous observance of the Sunday. He assigns to the famous statute of Charles II. a serious influence in creating the "classical English Sunday," though he admits that this law must be considered as "the product of an environment eminently favourable to mystical ideas." Some observers would have said downright that such a law could only have been made by a Legislature that was God-fearing according to its lights, and could only have been accepted by a free people of the same character. But this view does not seem to have occurred to Dr. Vercruysse. Another law cited by this observer is the well-known statute 21 George III., cap. 49, which constitutes every place of public entertainment opened on a Sunday for payment at the doors or by ticket a "disorderly house." After all Dr. Vercruysse's claim for his novel historical study of the law of the subject, these are not very recondite examples to support his position. Nevertheless he ventures to declare that in the near future there will be "a serious attenuation, if not the complete abrogation, of all dominical legislation of a religous spirit." He thinks that the spirit which inspires this legislation—which is still very much alive in the case of the Georgian statute—has nothing in common with that which has dictated recent measures for protecting "the dominical repose." He remarks that the religious motive in Sunday observance, however deserving of sympathy, is with difficulty to be considered as a programme of social legislation; and he does not find a trace of it in the modern factory legislation in which England is so far ahead of any Continental country. He thinks that it is the Factory and Workshop Acts which in reality regulate the observance of Sunday in the British industrial community; and he draws attention to the enormous difference that separates these laws, inspired by the modern spirit and social tendencies, from the old texts cited in his first chapter. And with regard to the execution of these laws, he is under no delusion. Remembering that laws intended to enforce Sunday rest have been met in Switzerland and Austria with manifold and almost insurmountable resistance, he is amazed at the completeness with which the English factory legislation in the same regard is carried out. He obtained from Mr. John Burnett, the Chief Labour Correspondent of the Board of Trade, the correct explanation of this,

to him, astonishing circumstance. It is nothing more than the statement that the Sunday and Saturday legislation in question merely endorses officially pre-existent custom and practice.

After reading Dr. Vercruysse's presentment of the law on the subject of Sunday observance, it is impossible to avoid the impression that when this Belgian lawyer talks of law, he invariably means statute law. Is there no common law in Belgium—no law to safeguard the rights of the subject beyond what is written down? It does not appear to have occurred to Dr. Vercruysse that Christianity is part of the common law of England, and that the right of the English people to their Sunday rest inheres in this fact. It is no statute deriving authority from King, Lords, and Commons, but the common law which says "thou shalt not steal;" and the companion enactment to this, as Carlyle pointed out, is "thou shalt not be stolen from." To say, as Dr. Vercruysse does, that English employers acquiesce in Sunday observance because "they also have lost the habit of a different rule, and are too practical to dream of a reform so unlikely as that of a return to the absolute liberty of labour," is to grotesquely misrepresent the sanction and practice of the whole subject.

When Dr. Vercruysse accepts the guidance of informants like Mr. John Burnett, he is tolerably safe; but he constantly improves upon his instructor's views of the subject, with strange results. Thus Mr. Burnett tells him that the Trade Unions have worked hard for the last twenty years to increase the duration of the weekly rest. As Mr. Burnett sees it, this is not a question of Sunday observance, because this was already customary. Dr. Vercruysse, however, must needs declare the two questions to be inseparable. Why? What has the question of the Saturday half holiday, or the shortening of the weekly toil by any other half-day's cessation, to do with the Sunday? Dr. Vercruysse, by the way, also holds that it is Trade Unions, and these organizations only, that are able to procure the weekly half holiday. We are not sure that he does not believe the English Sunday to be upheld by the Trade Unions; but, at any rate, he adopts unquestioningly the suggestion that without them there would be no weekly half holiday. This, of course, is sheer nonsense. It is precisely in the occupations which are devoid of "organization," in the Trade Union sense—such as the work of commercial clerks, warehousemen, and shop assistants—that the weekly half holiday is seen at its best. This class of occupations appears to have escaped the reporter's attention, though one would have thought the aspect of the business quarters of London and the chief towns of England on a Saturday afternoon and Sunday would be a sufficient indication of the working of some influence with which it was his duty to acquaint himself.

Yet this observer takes note of the fact that in England Sunday work is dispensed with in many industries which in the generality of countries regard it as particularly indispensable. Among these, the gas industry is named as exhibiting the phenomenon of appliances developed so as to be able to produce during the week all the gas necessary for the Sunday consumption. Dr. Vercruysse makes no reference to the somewhat voluminous literature of Sunday labour in gas-works; but without a knowledge of this it is hardly possible to write intelligently of the subject. He indeed dismisses this branch of his inquiry with hardly any comment.

Dr. Vercruysse is a witness of the depth to which the idea of Sunday rest is rooted in the English industrial system; but he is possessed with the desire to indicate the probable direction in which this idea may be expected to "evolve" in the future. He sees in various instances a tendency, starting from the workers themselves, to what he calls the "restoration of Sunday labour." He refers to some evidence given before the Labour Commission by Dr. Gritton as to the workmen employed in a certain gas-works having forced the Manager to execute some repairs on Sunday, in order that they might have the advantage of the extra rate of wages payable for Sunday work; and this he puts forward as an indication that the British workman in general is growing tired of his Sunday. To him the process appears to be that of giving up the idea of "Sunday rest" for that of a "weekly rest"—to be taken preferably when there is football or some other amusement to be had. It is true that the reporter is fain to admit that this evidence is of an exceptional rather than a general character; but nevertheless he takes it upon himself to pronounce the judgment that these meagre facts exactly "translate the evolution which is going on in many spirits, in a manner so interesting for the working population." It is evident here that the wish is father to the thought, or Dr. Vercruysse would have criticized his evidence more severely, or at least have sought for and given an equal valency to evidence on the other side. As it is, he admits the avarice of a few men seeking the advantage of "overtime" to the portentous classification of an "evolutionary indication," while resting sublimely unconscious that there is any real living force in the convictions of the vast majority of employers and employed concerning the sanctity of the Sunday rights and privileges which they have inherited from their forefathers.

As a lawyer and an official, Dr. Vercruysse is naturally much impressed with the importance of statutes, the registered declarations of Trade Unions, and other black-and-white evidence. But those who know England better than he does need no assurance that there is one motive that, with all their faults, actuates British workmen just as it does all other classes of the community, and is independent alike of statute law, officialism, and the conceits of science. This is the motive of right-doing, to the extent of the man's insight and capacity. If Trade Unions were to vanish from the English industrial system after to-morrow, and Parliament were to give up all future factory legislation, the British employer and the vast majority of his workpeople would still observe the Sunday; simply because they regard it as right to do so. A handful of Socialists who have imbibed the worst of the ideas prevalent on the Continent in this regard, and who have managed to become parasitic on the English Trade Union system, may mislead a foreigner in regard to the actual state of public opinion in England on the point of Sunday observance. Foreigners with prejudices of their own on the matter, like Dr. Vercruysse with his desire to see a process of evolution in a bit of overtime-grabbing, may find some support for their theories in the notorious abuses to which the English Sunday, like every other institution, is unhappily subject. An impartial survey of the whole field, however, will demonstrate that the British workman has no more inclination than his ancestors to labour on Sunday, and will equally fail to find a scrap of evidence worth the smallest respect that the British employer of labour entertains the desire to change his practice in this regard.

Dr. Vercruysse repeatedly discusses Sunday labour as having been abandoned for some reason, mainly statutory; and he speaks of the idea of making Sunday a working day as a "restoration." He does not, meanwhile, supply any proof that this way of treating the subject has an historical foundation; and it is probably a fancy of his own. He declares that "the factor which day by day takes more importance in the control of the question is the free will of the two parties confronting one another—employers and workpeople—both organized with sufficient strength to tackle with equal freedom the *economic* question which more and more discloses itself as constituting the veritable foundation of the controversy." This comes of seeing everything in the industrial world through Trade Union spectacles. Again: "Six or seven days' work per week is no more in the eyes of the Trade Unions than a question of wages to be fixed. Generally, as with all work not much sought after, this Sunday work is paid above the normal tariff. The master should pay the workman for the sacrifice of his scruples—he is asked nothing more." This is an example of "the lie that is part of a truth," and is therefore more difficult to deal with than a statement it is possible to meet with a direct negative. It is true that occasional Sunday work is paid at more than the normal rate of wages, for various reasons that should be sufficiently obvious to everybody without its being necessary to import that sneer about compensating men in money for the sacrifice of their principles. But it is equally true that Sunday work which is recognized as necessary and unavoidable, is not so paid. Take the case of gas-works. In this industry, when the work of carbonization is locally understood to be a continuous job, the stokers are paid for every day's labour at the normal rate. Of course, if the manager requires an emergency job to be done on Sunday, he expects to pay extra for it; but in no case is there any question of the sacrifice of scruples involved. It is merely a modern industrial version of the case of the ox or the ass "fallen into a pit," and needing to be extricated. So far as contemporary development of gas manufacture is concerned, the facts are directly contradictory of Dr. Vercruysse's fancy that Englishmen will relinquish their Sunday if they are paid for it; since the practice is growing of removing carbonizing work from the category of necessary and unavoidable Sunday labour.

The whole thing is so clear and intelligible to an Englishman, trained from his childhood to regard Sunday as a day of rest, that it is with the greatest difficulty that an English reader of Dr. Vercruysse can understand the position of indifference to, and unfamiliarity with, this observance, which is betrayed so often and so conspicuously in his observations on the subject. This disability vitiates his whole work. He is so wrapped up in his law and science and labour politics, that he never gives a thought to the fundamental reason why the majority of Englishmen observe the Sunday, which is simply and solely because they think it wrong to do unnecessary work on this day. It may be added to this explanation of the phenomenon, which Dr. Vercruysse has so strangely missed, that English people also believe that they would not derive any benefit, pecuniary or other, from doing unnecessary Sunday work. One cannot help thinking that if Dr. Vercruysse had taken the trouble to ascertain the views on this subject of an "unorganized" Cornish fisherman, he would have had his eyes opened to an aspect of it which his Trade Union friends could not show him.

Danger Signals on Water-Mains.—There is in operation, in connection with the distribution system of the Newark (N.J.) Water-Works, an automatic alarm which rings whenever the pressure falls below the normal point. Early one morning last month, the ringing of the alarm called attention to a break in a 24-inch supply-main at a point where quicksand necessitated the use of a plank cradling to support the pipe. This cradling had settled, opening one of the pipe-joints. Thanks to the promptness with which the break was discovered, the leak was repaired, and the pressure restored in two hours from the time the alarm rang.

THOMAS TRAVERS.

We regret to record the death of Mr. Thomas Travers, the Resident Engineer of the Cork Gas Consumers' Company, after a very brief illness. Mr. Travers entered the Company's service in the capacity of Assistant Manager when the undertaking was started in 1858; and in 1872 he was promoted to the managership. In that year, he joined the British Association of Gas Managers; and in the course of his connection with that body—extending to nearly a quarter of a century—he contributed largely to its Transactions. His papers were always of a thoroughly practical character, and were marked with strong common sense, with which was intermingled much of the humour characteristic of his countrymen, for he was a native of the city in which his life-work was carried on. At the meeting of the Association in 1876, he dealt with the question of "Piece-Work *v.* Day-Work, as applied to the Reduction of the Labouring Force in Gas-Works." Three years later, he endeavoured to show how gas companies could best promote the application of gas for heating purposes. Next year he took up an allied subject, and gave his colleagues an account of some experiments he had carried out upon the thermal power of gas heating apparatus. In 1882—the first year of the existence of the Association under its new title of The Gas Institute—Mr. Travers read a paper on "A Means for Reducing the Labouring Force in Gas-Works," in which he advocated the inclusion of the workers in a share of the profits derived from the undertaking. He expressed the opinion that Mr. George Livesey had "only performed half the work when he settled a sliding-scale for the benefit of the consumers and the proprietors, and omitted the workers, on whom the labour devolved of making it a success." He boldly declared that he would "include everyone in the staff, down to the youngest boy." In the discussion upon the paper, Mr. Livesey confessed that the author had "sustained the indictment." He frankly acknowledged that the work had only been half done, for he always felt that it would not be complete if it stopped at the shareholders; but how it was to be accomplished, he could not say. To use a well-worn phrase, a good many things have happened since then; and the thing has been done. Mr. Travers's next appearance before the Institute was in 1884, when he read a paper on "The Comparative Advantages of Dry and Wet Gas-Meters." Two years later, he discoursed on an experience he had had with purification by oxide of iron. After a few years' interval, Mr. Travers again came before the Institute with a paper; its subject being "The Extension of Gas Companies' Responsibility to Fittings beyond the Meter." At the meeting in Belfast in 1893, at which his late colleague Mr. Denny Lane presided, he brought forward a suggestion on gas-burners, which, in conjunction with a paper dealing with the supply of fittings by gas undertakings, by Mr. Lyne, of Wexford, led to a good discussion. In the following year he had a paper on "Gaseous Fuel;" and this was his final contribution to the Transactions. He was in attendance at the meeting of the Institute last June, and took part in the discussion of Mr. Holliday's paper. The foregoing, it will be acknowledged, is an exceedingly good record, and one well worthy of emulation by the younger members of the Institute. Mr. Travers's experience was varied, and it was always freely placed at the disposal of his professional brethren.

Mr. Travers, who was in his 64th year, leaves seven children; one of his sons—Mr. Thomas P. Travers—being the Assistant Manager at Cork. The Directors of the Company are to be sympathized with in the losses they have lately sustained by the removal of their two principal officials. In the number of the "Journal" for Dec. 3 last year, we had the painful duty to announce the death of their esteemed Secretary, Mr. Denny Lane; and now, by a remarkable coincidence, a similar duty has to be discharged in regard to their Resident Engineer.

OBITUARY.

A vacancy has been caused on the directorate of the Littlehampton Gas Company by the death of Captain Richard Smith Gates, at the age of 70 years. The deceased, who was a shipowner and coal merchant, was a keen man of business who had the utmost esteem and confidence of his colleagues.

PERSONAL.

Mr. John Cocks has left England to sign, on behalf of Messrs. Fielden Bros., of Manchester, a renewal of the concession, which he has been instrumental in negotiating, for the lighting of the city of Pernambuco for the next 40 years—the present agreement terminating on the 31st inst.

Mr. William Hardie, on the 31st inst., retires from the office of Secretary and General Manager of the Newcastle and Gateshead Gas Company—an office he has held for so many years with credit to himself and to the satisfaction of all with whom he has been associated. As testifying to the esteem in which Mr. Hardie has been regarded by the Board of the Company, a retiring allowance of £500 a year has been granted to him; and the wish has been expressed that, so long as his health permits, he may attend to such of his present duties as he cares to undertake. Mr. Waddom has been selected by the Directors to succeed Mr. Hardie.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting at Bradford.

The One Hundred and Eighth Quarterly Meeting of the Manchester District Institution of Gas Engineers was held last Saturday at Bradford, under the presidency of Mr. Isaac Carr, Assoc.M.Inst.C.E., of Widnes. There was a very full attendance of members, who had a long programme of business to get through, which was carried out with commendable punctuality. The Manchester contingent of the members arrived at the Victoria Station, Bradford, shortly after half-past eleven o'clock, and found waiting for them a goodly number of their *confrères* who could more conveniently travel direct to the town. The party—numbering some 60 in all—at once set off for an inspection of the Corporation electricity generating station, which had been thrown open by permission of the Mayor (Mr. Councillor Speight), who is Chairman of the Gas and Electricity Committee. His Worship was present, together with the Electrical Engineer of the Corporation (Mr. Alfred H. Gibbings), in order to give every possible information to the members so as to render the visit both interesting and instructive. At the close of the inspection, a move was made for the Midland Hotel, for lunch, which was served at 1 o'clock. Thereafter Mr. William Carr proposed, and Mr. Thomas Newbigging seconded, a vote of thanks to the Mayor and Corporation of Bradford for their courtesy in permitting the morning's visit to take place, and to his Worship for gracing the luncheon table with his presence. At 2 o'clock sharp the business meeting was started; and the proceedings (reported below) were continued till tea was almost ready to be served at 5.45, and which after the long afternoon sitting was a welcome relief. The train to Manchester for the return journey was not timed to arrive till after 9 o'clock, so that the majority of the members were altogether kept busily employed for more than ten hours—a very fair day's work indeed for a District Gas Association.

On the President (Mr. Isaac Carr) taking the chair,

The Hon. Secretary (Mr. S. S. Mellor) read the minutes of the previous meeting, which were confirmed.

New Members.

Mr. James Dougall, of Hoylake, Mr. William Orme, of Congleton, Mr. Harry Townsend, of Wakefield, Mr. John Merrell, of Gaythorn, Manchester, and Mr. D. E. Garlick, of Barnoldswick, were elected members of the Institution.

Election of President for 1897.

Mr. T. Bower (Hartlepool), in proposing that Mr. Robert Porter, of Elland, should be elected President for the ensuing year, said he felt that his name would be acceptable to all the members. He (Mr. Bower) had been closely connected with Mr. Porter from the commencement of his career as a gas manager; and he was sure that if Mr. Porter displayed the same energy in connection with the Institution while President as he did in his own business, they would not regret having elected him to the office.

Mr. T. N. Ritson (Kendal) had great pleasure in seconding the resolution.

Mr. W. W. Hutchinson (Barnsley) supported the resolution. He had followed Mr. Porter's career with some interest, and had arrived at the conclusion that he would do great credit to the Institution.

The resolution having been put and carried unanimously,

Mr. Porter said he was very grateful to the members for the honour they had conferred on him. He accepted the office with a certain amount of diffidence, inasmuch as many distinguished members of the Institution had previously filled the office, and he felt that it would be somewhat difficult to keep up the stability of the work which they had begun. He had not had much opportunity of qualifying himself for the office, as he had only been on the Committee for two years; and the President this year had done his work so admirably that he had left little to be accomplished by his successor. But "having put his hand to the plough," he did not intend to look back; and with the aid of the members, he hoped the proceedings of the Institution during the current year would be as interesting and profitable as in the past. It had been suggested to him on more than one occasion that the Yorkshire section of the Institution had not done all that they might to make the meetings interesting—that when the meetings had been held out of Yorkshire, they failed to attend; and, in addition to this, they had not contributed the number of papers to the transactions that they might have done. But he thought the Yorkshire members had done something to justify their existence; for, looking back during the last six years, he found there had been 43 new members, 21 of whom had come out of Yorkshire, which county had also been responsible for a good many of the remaining 22. In conclusion, he said he would endeavour to carry out the duties of the office to the satisfaction of the members.

Presentation to the Hon. Secretary.

The President then rose to present Mr. S. S. Mellor, the Honorary Secretary, with a gold watch and chain, an illuminated

address, and a purse of gold. He said the subject needed no introduction from him. He was very pleased to say that the members of the Institution who knew Mr. Mellor, and had seen and felt all the advantages of his work, had responded to the appeal for subscriptions most generously. They had received 77 subscriptions, which had realized the very handsome sum of £52 11s. 6d. The watch bore the inscription: "Presented to S. S. Mellor, Esq., Engineer and Manager of the Gas-Works, Northwich, by the Members of the Manchester District Institution of Gas Engineers, in appreciation of his services as Honorary Secretary for seven years, November, 1896." In addition to this, so that there might be something for him to show that he did not carry all their appreciation in his pocket, they had decided to give him an illuminated address. After expending about £40 on the watch and address, there was the very handsome balance of 11 guineas remaining, which it was also proposed to hand over to Mr. Mellor. But before doing so, he should just like to place on record his appreciation of Mr. Mellor's services, and to remind the meeting of what every other President had said—viz., that Mr. Mellor had been most invaluable to them in conducting the affairs of the Institution. He did not know whether it occurred to them to think of the amount of work which such an Institution as theirs entailed upon the Secretary. They had 120 members, and held four meetings in the year, which was equal to an Institution having 500 members. The Secretary of the Institution had actually the same amount of work to do as the Secretary of The Gas Institute—in fact, he had more, because he had four quarterly meetings to arrange for. He was not depreciating the work of the Secretary of The Gas Institute; he merely mentioned the fact by way of comparison, to show the great tax it was upon any man who occupied the office of Secretary. Another thing he had great pleasure in mentioning was that they might hope to retain Mr. Mellor's services for some years to come. In the early part of the year, it was thought that he would have to retire; but Mr. Mellor had been fortunate enough to arrange with his Directors (since he declared his intention of resigning) to receive more assistance in his office; and he now felt himself in a position to continue his duties, if it was the pleasure of the members that he should do so, with much greater ease and comfort to himself than hitherto. It was very gratifying to be able to record this, because all who knew Mr. Mellor knew how exceedingly difficult it would be to find a successor. Mr. Carr then made the presentation, saying he hoped that Mr. Mellor would live many years to wear the watch; and when at last the time came to lay it down, his sons would take it up, and reflect on the warm appreciation in which he was held by the Institution.

Mr. MELLOR said the members would excuse him if he did not make much of a speech in returning thanks for the presents. He must say that when he took over the duties of Hon. Secretary, he never expected to receive such valuable gifts. It had been a work of love to him to do what he possibly could to further the interests of the Institution. Since he took over the office, the Institution had considerably improved in point of numbers; and he trusted it would still further improve, not only in this respect, but also in point of usefulness.

The reading of the papers was then proceeded with; the first by Mr. G. E. STEVENSON, M.Inst.C.E., of Manchester, entitled—

SOME NOTES ON THE COMPARATIVE COST OF SUPPLYING LIGHT BY GAS AND ELECTRICITY IN MANCHESTER.

From time to time comparisons have been made between the cost of lighting by gas and by electricity; and much divergence of opinion has been expressed as to the relative value of the two methods of illumination. The chief obstacle in the way of arriving at an agreement on this matter has been the difficulty of determining upon a common basis for the calculations to be made. Indeed, to institute a full and exhaustive comparison is fraught with almost insuperable difficulties, owing to the dissimilar nature of the elements to be considered. On the side of electric lighting would have to be considered the expense a consumer is put to in renewals of lamps, and the saving he would realize in regard to decorations. On the side of gas, there would be the expense incurred in not extinguishing gas lights, but leaving them turned down. For these considerations, we have no definite data to base a comparison upon. I therefore propose to confine myself in this paper to the question of cost of supply; leaving out of consideration all advantages or disadvantages incurred on the consumer's premises.

On the subject of comparative cost, some interesting information was given by Mr. W. R. Chester in his Inaugural Address to the Gas Institute this year; and if the basis of comparison which he adopted be accepted as correct, the results are very favourable to gas lighting. After careful consideration, I am of opinion that the basis upon which Mr. Chester founded his comparison is a fair and reasonable one; and I propose to follow the same lines in dealing with the results obtained by the Manchester gas and electric light undertakings. I am, however, bound to tell you that this basis is objected to in the electric light department, for reasons to be hereafter explained.

The Corporation electric light station was started in 1893. The development of the undertaking has been very rapid; and it now ranks first in the list of provincial electric light installations. At the close of the last financial year, the number of incandescent electric lamps supplied was 89,294 of 8-candle power, to which standard, for comparison with other undertakings, all lamps of larger size are reduced. There were in addition 806 arc lamps, and 47 motors supplied with current from the conductors of the station. The total length of conductors was 113½ miles. The undertaking has been singularly successful financially; and in the last year of working a profit of £11,138 was realized, notwithstanding a reduction in the charge from the original price of 8d. per unit to 6d. per unit.

The generating plant originally put down was, during the last year, fully utilized. The area of supply comprises the best streets of the city, and the majority of the largest consumers of light. The supply has not hitherto been extended into second-rate or suburban districts. The conditions of consumption are very favourable. The average consumption of current works out to over 20 units per lamp per annum; and, on the basis of comparison which I have adopted, to about three times the average consumption of gas by the gas consumers. It is therefore evident that the Manchester electric light undertaking was, during the last financial year, in a most favourable position for carrying on the supply of electric energy economically, both as regards cost of production and charges on capital account.

In calculating the cost of supplying light by electricity, the basis taken is the equivalent in Board of Trade electrical units to 1000 cubic feet of gas of the average illuminating power produced at the Manchester Gas-Works, during the year over which the gas and electric light accounts simultaneously extend. The gas manufactured is tested twice a day at each of the stations; and the average of all the tests made is the figure which is published in the accounts of the gas department. This figure is 19·55 candles for the year ended March 31, 1896. The equivalent in electrical units is determined by the average rate of consumption of electric energy in incandescent lamps per candle power of light given out. This is the crucial point in the basis of comparison. Mr. Chester took an average of 4 watts per candle per hour. This is a rate which has been regarded by electricians as a good average; and I think it is a fair one to take. There are lamps which yield a higher efficiency; and if these lamps were equally durable with those of lower grade, and if they retained their high efficiency, the argument in favour of taking the highest efficiency lamps as the standard would be a strong one. We have it on the authority of electricians that they do not comply with these requirements, and that, in fact, no electric glow lamps retain their initial efficiency permanently. As we are taking no account of renewals of lamps, and, moreover, do not test the gas in high efficiency burners, it would be unfair to take other than an average efficiency as the basis of our present calculations.

A Board of Trade unit being 1000 watts, and 4 watts being consumed per candle per hour, it follows that one unit consumed per hour is productive of light equal to that of 250 sperm candles. One thousand cubic feet of 19·55-candle gas consumed in one hour in suitable burners, each burning at the rate of 5 cubic feet per hour, is productive of light equal to that of 3910 candles. Dividing this figure by 250, we obtain a quotient of 15·62, which may be taken to be the equivalent for lighting purposes in electrical units of 1000 cubic feet of Manchester gas. Now, if we take the total quantity of electric energy accounted for in units in the electric lighting accounts for the year, and divide that by 15·62, we shall get a quantity equivalent to thousands of cubic feet of gas sold; and with this quantity, we can analyz the electric lighting accounts on the same lines as we do those of gas undertakings. Such an analysis has been prepared, and is here tabulated side by side with that of the gas accounts for the same year, ended March 31, 1896.

GAS LIGHTING.	Per 1000 Cubic Feet of Gas Sold.	ELECTRIC LIGHTING.	Per Equivalent of 1000 Cubic Feet of Gas.
Manufacture—		Generation—	
Coals, less residuals	os. 9·57d.	Coals	os. 6·31d.
Purification	0 0·33	Oil, waste, water, &c.	0 2·31
Wages	0 2·74	Wages	0 4 79
Repairs & maintenance	0 4·30	Repairs & maintenance	0 7·78
	1s. 4·94d.		1s. 9·22d.
Distribution	0 1·66	Distribution	0 5·77
Management	0 1·94	Management	0 6·23
Rents, rates, and taxes	0 1·78	Rents, rates, and taxes	0 3·30
Law charges	0 0·01	Law charges	0 0·29
Bad debts	0 0·04	Bad debts	0 0·03
Net cost	1s. 10·37d.	Net cost	3s. 0·84d.
Interest and sinking fund	0 3·25	Interest and sinking fund	1 7·58
Total	2s. 1·62d.	Total	4s. 8·42d.
Revenue from sale of gas	2s. 3·90d.	Revenue from current	6s. 5·75d.
Meter rents	0 0·33	Meter rents	0 1·84
Total	2s. 4·23d.	Total	6s. 7·60d.
Deduct expenses	2 1·62	Deduct expenses	4 8·42
Profit	os. 2·61d.	Profit	1s. 11·18d.

From this statement, it will be seen that the net cost of the gas sold per 1000 cubic feet averaged 1s. 10·37d.; while the net cost of its equivalent light value in electrical energy, as consumed in incandescent lamps, averaged 3s. 0·84d. Adding the charges for interest on capital, &c., we get 2s. 1·62d. for gas, and 4s. 8·42d. for electricity. The result is more favourable to the

electric light than in the case of Nottingham, as the comparative cost is in the proportion of 1 for gas to 2·2 for electricity, instead of 1 to 2·73 as given Mr. Chester.

It will be noticed that the charges for interest and sinking fund are very much higher in the electric light than in the gas undertaking. The comparison is not quite "on all fours," owing to the large amount of capital which has been paid off by the gas undertaking by redemption during the long period of its existence. There is, however, no great disparity between the capital employed in the Manchester gas undertaking and that of other similar concerns, in proportion to the business done; for it is just equal to that employed by the South Metropolitan Gas Company, and but little less than at Birmingham, while it is considerably more than at Glasgow. Under any circumstances, however, the sum of 1s. 7·58d. per equivalent of 1000 cubic feet of gas is a heavy charge on capital expenditure, and one that would not be incurred, or even approached, by any gas undertaking started at the present day in the kingdom.

The total light value of the electrical output for the year was equal to that of 115 million cubic feet of gas. A gas-works capable of supplying this annual quantity of gas in a populous district, could be constructed, with mains, services, and meters complete, for £50,000; whereas £250,000 has been expended on the electric light installation. I do not mean to infer that the expenditure has been extravagant. So far is this from being the case, that there probably is not another installation of the kind in the kingdom which has been established with so much regard to economy, as well as efficiency.

One item in the analysis demands our special attention—that is the cost of the coal. This is less by one-third, light for light realized, in the case of electricity than in that of gas. It would therefore appear to be true that more light may be obtained from coal by the indirect method of charging the potential energy of the coal upon electricity, than by directly raising the potential to a higher level in the form of gas. This is, however, only apparently the case, and is due to the imperfect and extravagant manner in which the energy of the gas is utilized.

A proof of this is that if the heat energy of gas be applied to produce light in the same manner as the energy of the electric current is made to produce it—viz., by rendering a suitable material incandescent—the superior energy of the gas is at once revealed. Another proof is that the heat energy of gas may, in its turn, be charged upon electricity, by utilizing it as motive power in a gas-engine and driving a dynamo therewith, when it will be found that 2½ times as much light is obtained from electric glow lamps supplied with current by this means than by burning the gas in standard test burners.

So far as manufacturing expenses go, gas has but little advantage over electricity; but when we come to distribution, we find a striking difference in favour of gas, due to the greater simplicity of the distributing plant, and the facility which gas affords for the transfer of energy to a distance at a minimum cost. Management is an item which, though proportionately high at present in the electric light accounts, is capable of reduction by extension of the business. The remaining items of expenditure are probably not capable of much alteration.

It is now proposed to extend the supply of electric current for lighting purposes into the suburbs of Manchester. I leave it to the electricians to decide whether such an extension is likely to place the electric light undertaking in a more favourable position, as regards cost of production and distribution. That it will not tend towards a reduction in the capital charges is, I think, an opinion which may be safely expressed. There is no question of the practical possibility of a venture of this kind, if resolved upon; nor need the extension of the system cause us the slightest anxiety on the score of a possible diminution of the gas consumption. There is room for both to live and thrive. Personally, I feel that in the gas department we are indebted to the establishment of the electric light, which not only assists us much on foggy days, but has given us time to put our house in order before being overwhelmed by the rush of increased consumption of gas that is now being experienced.

Discussion.

Mr. STEVENSON said, before the discussion commenced, he should like to say that he had hoped their Electrical Engineer (Mr. C. H. Worthingham) would have been able to be present and take part in the discussion; but he was sorry he had been detained by a prior engagement. That gentleman had informed him in general terms of some of the criticisms he would have made on the paper. Mr. Worthingham principally objected to the basis of 4 watts per hour for the electricity, and taking the gas at 19·55 candles. He said the average amount of light the consumers got out of their gas was not at all what was shown on testing; and he considered that 12 candles would be the proper illuminating power to take, which would be equal to 10, and not 15½ units. Of course, on this basis, the analysis would turn out to be very different. Mr. Worthingham also said that, if they were to take the gas as tested by the ordinary method, they ought to take as the basis of calculation the rate of consumption in the highest efficiency electric lamps, which he said was 2¼ watts instead of 4 watts.

Mr. S. GLOVER (St. Helens) said the first thing to do was to thank Mr. Stevenson for giving them an opportunity of looking into the matter of the comparison of the cost of gas and electric light. Dealing at once with the method of using the energy produced, he could not help thinking that, as electrical engineers had gone to so much trouble to see that the force they generated was properly used in suitable lamps, it was a great discredit to gas engineers that they had not done more in the past to see that the energy they produced was properly utilized. He thought it would be quite right to take in each case the highest efficiency lamps, and not the ordinary method of burning gas, for purposes of comparison. It would be better to compare the electric energy used in incandescent lamps with the incandescent gas-burner. He could not understand Mr. Worthingham's objection to their taking the highest efficiency burners for comparison, as they knew the consumers in many cases only got 50 per cent. of the efficiency produced. His visit to Bradford had confirmed him in his idea that they ought to have taken a great deal more care that the consumers properly employed the energy with which they doubtless supplied them; and they had received a rebuke from the fact that the electrical engineers were now doing what gas men could have done years ago. The whole question had not been stated. There were many advantages to be derived from the use of electric light which they would be very foolish, if they wanted to be considered engineers, to ignore. They ought to enter the consumers' premises and take the thing in hand right up to the ultimate use of the gas; because it was owing to the peculiar advantages possessed by the electric light that people were willing to pay a higher price for it. Taking all the advantages that the electric light had, the initial cost was not the true cost to the consumer. That was what they would have to deal with, because the consumers would bring them to it in the future. They must follow both supplies of energy right up to the burner, before they could say that they had done the whole of their duty. Therefore, they had to face the fact that the electric light works supplied the full energy right up to the lamp, and into the most beautifully decorated rooms, without throwing on the consumer a lot of additional cost for many things that were always charged against gas.

Mr. A. H. GIBBINGS (Bradford) said he was hardly prepared to say very much on the paper, as, unfortunately, he was not able to be present when it was read. The exigencies of his department had called him away that day, which was another illustration of how they had to be on the spot to meet every demand upon them. The gas industry had no doubt given electrical engineers a very great task to perform; because, having been in the field so long, their works had been established, and the public had become used to a certain price per annum for their illumination. If they went in for electric light, or oil, or whatever it was, they expected to get the same amount of illuminating power for the same cost; and if they did not get it for the same cost, they expected the additional outlay to be made up by other advantages. It was only in this way that the electric light could be put forward as a competitor of gas. They had to compete with the advantages possessed by the electric light, such as the conditions under which it would be used, and the absence of noxious gases given off. This, of course, was somewhat beyond the scope of the paper, which seemed to take two standpoints—first, the cost of producing, and then the cost of supplying to the consumer. The relative cost taken of supplying to the consumer would be all right where both the electric light and the gas undertakings were working together under the same Committee; but where a gas company were being attacked by a corporation with the electric light, a different set of considerations arose. It was very nice to draw comparisons which were more interesting to the parties concerned than to the public itself. His idea of the proper method of drawing a comparison between the cost of gas and electricity was that they should, in the first place, take a standard gas-burner consuming so many cubic feet of gas per hour of a certain standard illuminating power. By the Board of Trade regulations, they were bound to supply the electric light at a declared pressure, and were only allowed a variation of 4 per cent. If the lamps were good, it stood to reason that the consumer would get the illuminating power that he bargained for; but, for the purpose of comparing the cost, they should base their calculations on the cost of producing the standard light, not on the cost of producing gas generally, which might vary from 12 to 20 candle power. Electric light did not vary to anything like the same extent. Therefore he deprecated general statements as being utterly beside the mark. He had tried to get out tables of the comparative cost of gas and electricity in different consumers' premises, and had been asked by one of the biggest consulting engineers in the country to supply him with the figures. In a town in North Wales, he found that one consumer, who had been paying £250 for his gas, only paid £90 for the electric light; while another consumer who had paid £250 for the electric light, only paid £80 for his gas. All these cases very largely depended, not on the accurate comparison of the number of lights that had been installed in the place of the gas-lights, but very often on the ideas of the person who made the change. The tendency with electric light was for people to instal it with a much more lavish hand than they would ever think of putting in gas-lights. He should like to have had an opportunity of going into the figures, and examining them critically; and he intended to do so, because they would be of great interest to him personally. His own idea was that no comparison should be made, unless it were based upon some theoretical standard which was equitable and indisputable in both cases.

Mr. THOMAS NEWBIGGING said it was only a matter of fairness that they should acknowledge the excellence of the paper which they had had from Mr. Stevenson. He had given them a very simple method of comparing the value of the two lights, gas and electricity, for which they were exceedingly obliged, and would find very useful. He would also like to acknowledge the exceedingly fair way in which Mr. Gibbings put the matter before them. They did not often have it stated so fairly from their point of view. There was a good deal in what Mr. Glover had said as to their having neglected their duty in not following the gas from the retort right up to the burner; but he believed it had been more the misfortune of the gas engineer that he had not been able to do so. An Englishman's house was his castle. They could not very well go in and order a consumer to use a certain burner; he picked up his burner from the first shop he called at in the street. It might be a good, bad, or indifferent burner. But there it was; and he exercised his own discretion, and pleased himself as to what he used. On the other hand, electricians had a much more costly "burner" to supply. It was a burner that could not be made by anyone; and the electricians had a chance—he would not say of insisting on their burners being used, but the consumer had no option. Therefore, he took the burner supplied to him, which was probably the best of its kind. In this way, the electrician had a very great advantage. All the same, he (Mr. Newbigging) thought there should be a little more exertion on the part of gas managers to endeavour to get the consumers to use the burner which would develop the most light. In favour of electricity, he would like to say he did not agree with Mr. Stevenson's figure for the construction of a gas-works. He said that a gas-works capable of supplying 115 million cubic feet of gas could be constructed, with mains, services, and meters complete, for £50,000. This would work out to about £450 per million cubic feet. He did not agree with this, if it included the cost of the site and of the Act of Parliament—everything from the very beginning and establishment of the company. That was not a sufficiently ample figure. Therefore, from his point of view, it was doing an unjustice to electricity. Both the interest and the sinking fund would be more if it were a higher figure. When a works was established and in full going order, extensions could be made for £450 down to £350 per million; but to establish a works capable of producing 115 million cubic feet, if everything was done in proportion to the capital, would cost £63,000. In this way, he would increase the figure for interest and sinking fund—he could not say how much, because he had not worked it out. Of course, the increase would be in favour of electric lighting.

Mr. GLOVER said Mr. Newbigging had evidently not been in a town where they were troubled with the "gas-burner man." However much an Englishman's house was his "castle," it was always liable to be besieged by the "burner man," who made the consumer pay as much for an inferior article as he could get an incandescent electric light for in these days. The foolish consumer, who had been left to flounder about for the right method of using the energy supplied him by the gas company, gave as much for a gas-burner as he would have to pay for an electric lamp.

Mr. W. W. HUTCHINSON (Barnsley) testified to the excellence of Mr. Stevenson's paper. He said he hoped the author would have given a little more detail with regard to the application of gas-engines to produce electricity. Mr. Stevenson had stated that, by the use of a gas-engine, two-and-a-half times as much light would be obtained as by the standard test burner usually employed. But he failed to follow up this conclusion by saying what the comparison was with incandescent burners and those which gave so much more light and were in general use at the present time. In this way he did an injustice to gas in the comparison. So far as he (Mr. Hutchinson) could grasp the figures, the electric light cost, practically speaking, twice as much as gas, even taking into account the correction that Mr. Newbigging had made with regard to the initial outlay for gas-works. He should like to know if Mr. Stevenson had any figures to put before them with regard to the relative cost to a consumer of supplying fair-sized premises with the electric light and with gas with, as near as possible, the same amount of illumination. There had lately been one or two cases in his town; and, from the information he had obtained, he found that the most profitable way of supplying the electric light to moderate-sized premises was by using a gas-engine. He should be glad to know if Mr. Stevenson could give them any information on the point whether allowing the consumers an advantage in the shape of a reduced price for gas used in engines would be paving the way for the subsequent institution of electric lighting. So far as his information went, it was not so; but he should like to hear the latest information on the subject.

Mr. T. B. BALL (Rochdale) wished to make a remark with regard to the figure Mr. Stevenson had put before them, of 1s. 7d. for an equivalent of 1000 cubic feet of gas as the proper charge for interest and sinking fund on an electric light installation. He could not help thinking what a load this was placing at once on electric light undertakings. It had yet to be proved that the onerous conditions which the Local Government Board insisted upon for the repayment of loans advanced to these undertakings were absolutely essential. If this very heavy charge of 1s. 7d., compared with 3d. per 1000 cubic feet for gas, could be lightened—and he believed it would be very considerably lightened—it would be a great help to purveyors of electric light. It was a very serious item in the cost of electric lighting; and he could not help thinking it would be very materially reduced. One was driven to this conviction by the fact that private installations of electric light could be run much more economically than public installations. He believed some of his colleagues in Lancashire—those who had electric light installations in their towns—could endorse the statement that many large consumers of electric light had ceased to take their supply from the corporation because they found they could produce it much more economically themselves. This was a contingency which he thought all installations of electric light had to face. At the same time, Mr. Stevenson had told them that the total light-value of the electric light output in Manchester was equal to 115 million cubic feet of gas per annum, which was a very important factor of itself. The profit on 115 million cubic feet per annum would be a grateful addition to many exchequers; and, although it was deprecated that they should look upon the electric light as a rival, they could not get behind the fact that, to the extent of 115 million cubic feet, gas was supplanted by electricity in the case of Manchester. They all of them, he presumed, had more or less experience of this sort of thing in most towns. The point he really wanted to make was that under existing circumstances the electric light installations had not quite as much free play as the gas undertakings had with reference to the expenditure and to the repayment of capital charges; and to that extent they were handicapped in their competition with gas supply.

Mr. CHARLES WOOD (Bradford) said some of what he had intended to say had been covered by the previous speakers. As Mr. Gibbings had pointed out, the gas and electric light were worked on amicable lines at Bradford—there was practically no competition; and in this way they were able to come more accurately at the actual cost of the supply. He thought the basis of 4 watts per candle-hour for the lamps which they were supplying in Bradford to consumers free of charge, was rather too much. The lamps which they were supplying averaged 3½ watts per candle for 1000 hours. As electric current was supplied in Bradford at 5d. per unit, with the lamps thrown in, and the gas at practically 2s. per 1000 cubic feet, the comparative cost of the two worked out at an average, in a good many cases, of something like double the expense in the case of electricity. But against this extra expense, had to be set the advantages which, in the opinion of a good many people, were to be derived from the use of electricity, in the saving of decorations and so on, and which more than made up for the additional cost. This was a point that was not to be lost sight of, and one which they would have to combat in the future.

Mr. S. MEUNIER (Stockport) said they had a fair amount of electric light in his town, but there was no public supply. With regard to the difference in the cost between generating one's own electric light by means of a gas-engine and taking it from a central station, he should like to say that some time ago he was talking over this question with the Electric Light Engineer to the London and North-Western Railway, who told him of an installation they had in Liverpool worked by a gas-engine—it was a mixed installation of arc and incandescent lighting. They had very carefully taken out the total working cost of their gas, and found that light for light the extra cost was equivalent to 3d. per 1000 cubic feet more than they paid for the Liverpool gas. With regard to the comparisons generally made by electric light engineers, so far they had been between the best system of electric lighting and the worst system of gas. Mr. Gibbings had been the first to propose something fair and square. In regard to gas, it was an extremely difficult matter to know what basis they were going to start from. Gas was very largely used not only in buildings, but it was practically the light adopted by the smaller dwellings. With the latter class, they were troubled with the fact that gas had been used for a little over a hundred years; and every gas consumer thought he knew as much about how to burn gas as the gas engineer himself. The electric light people were, however, better situated. It was a new thing; and people wanting the electric light went to the engineers for advice in a way that he hoped they would come to the gas engineers. The consequence was they used good lamps, and obtained the maximum efficiency from the light. Unfortunately, it was just the other way with gas. In spite of all attempts to dissuade people, they would stick to the old iron burners. They had had a little experience of the "burner man," mentioned by Mr. Glover, in Stockport; and they only wished they could get the same price for their burners as this individual got out of the customers for his. He had heard of cases where they charged 9d. apiece for the burners, and the consumption of gas had gone up 100 per cent. Then there was the influence of the plumber. People who were too busy to attend to the gas themselves, called in a plumber to set matters straight, who put on the burner the best way he could; the consequence being that the consumer suffered. He (Mr. Meunier) only brought these instances forward to show that the electric light industry was not labouring under the same difficulties that gas engineers were. He still thought that so far they had not had a fair comparison between gas and electric light; and he should like to see some definite and reliable formula laid down.

Mr. R. PORTER (Elland) said Mr. Stevenson had stated in his paper that the total light-value of the electrical output at Manchester for the past year was equal to that of 115 million

cubic feet of gas; but he did not understand him to say that, if the electric light installation had never been started in Manchester, they would have been selling 115 millions more gas. They had heard a good deal about the advantages of electricity, but nothing about its disadvantages, other than the cost. One of the disadvantages he should like to hear something about, from those qualified to speak to it, was that of its effect on ventilation.

The PRESIDENT said he should like to say a word with regard to the figures Mr. Stevenson had placed before the meeting. Taking the figures of the net cost of producing gas and electricity, leaving out the interest and the sinking fund, the cost of making electricity was, on the showing of Mr. Stevenson (who they all agreed would be as fair as he could), only some 55 per cent. more than the cost of making gas. Of course, it would come to more if interest and sinking fund were included; but, as Mr. Ball pointed out, as the business increased and more favourable terms were obtained for repayment of capital, these items must of a certainty decrease. The figures divulged by the paper showed the enormous progress that electricians were making in reducing the cost of generating electricity. Only a few years ago, the cost was looked upon as double and treble that of gas. But it was no longer so; and this should stimulate gas engineers to make renewed efforts to improve the cost of manufacture. As he pointed out in the early part of the year, they had to face the electric light, which, in his opinion, was a really serious matter. They were very much indebted to Mr. Stevenson for having brought the paper before them, as its usefulness would be apparent to all.

Mr. STEVENSON, in reply, said he was afraid he should rather disappoint those who had asked questions of him when he said that, in entering into his reply, he should have to strike out in rather a different direction to that followed by the speakers. As soon as he went into the matter of the electric light accounts and their working at Manchester, he saw that electricity was, as the President had just said, rapidly gaining on the heels of gas in the cost of production; and the question arose in his mind, Was this final, or was there something behind by which they might turn the lever the other way, and show that there was a great deal to be done in the case of gas? While, on the question of light-value—burning gas in ordinary gas-burners, and getting light from electric glow lamps as supplied by electricians at the present day—there soon would be hardly any difference in cost involved, there was an enormous difference between the value of the gas and the electric current in regard to the heat energy. It occurred to him that this was the point which they had to drive at. Mr. Ball spoke about the interest and sinking fund at Manchester. He was not absolutely certain, but he thought 25 years was the period fixed. If electric light undertakings were being handicapped in relation to gas undertakings as regarded the period allowed for repayment, the Local Government Board were reducing the period for gas undertakings very much. They could not now borrow for gas undertakings for a longer period than 30 years; and they would probably be very soon put upon the same terms as the electric light undertakings. The latter might be extended to 30, or the gas companies be reduced to 25 years. The great point to consider was how properly to deal with the energy produced by the gas. Hitherto they had been expending it in a comparatively wasteful manner, by consuming it in ordinary burners. It had been shown that 1000 cubic feet of gas was equal in lighting value to 15½ electric units; but when they came to heat-energy, 1000 cubic feet of 19½-candle gas was equal to 12,000 units of electricity. This was something they could work upon. With incandescent gas-burners, they obtained about 16 candles per cubic foot, instead of 4 candles—at once a multiplication by four. There was no reason why these lines should not be followed up, and still greater utilization of the energy obtained. When coal was carbonized for the purpose of making gas, something like 70 per cent. of its energy was got back again in the form of gas or in the coke and tar. But in producing the electric current by the consumption of coal in steam-boilers, the utilization of the energy was very small, and the waste something enormous. They had to deal with boilers which gave 45 per cent. utilization, if the coals were very good. There was a waste of 20 per cent. in the working of the dynamo, so that they only obtained about 80 per cent. of efficiency.

Mr. GIBBINGS: About 84 per cent.

Mr. STEVENSON (continuing) said 4½ per cent. of the energy of the coal could be put in the electric current, but it did not all get there, as against 70 per cent. in the case of gas. About 24 per cent. went into the gas, 35 or 37 per cent. into the coke, and something into the tar. There was no question that they would by-and-bye have to deal with gas in a different way from what they were doing at present. He had not had time to go into the details of the comparative value of an electric light installation driven by a gas-engine and one supplied from a station. In his paper he had dealt with the supply from a central station. There was no doubt whatever that, if they had moderately large premises, an installation could be worked more cheaply with gas-engines than from a station with a steam-engine. His calculation of 2½ times as much light being obtained from electric glow lamps by the use of gas-engines, was theoretical. They knew how much a gas-engine took per horse power, and they also knew what was the equivalent in watts of the horse power; so that it was a very simple calculation to get at what would be obtained in the electric lamp. As to the dispute between himself and Mr. Worthingham as to the basis to go upon, there were higher efficiency lamps than 4 watts; and it was quite true that gas consumers used very inferior burners. But it was not true that these high efficiency lamps could be relied upon for a long period; nor could one depend upon any number of lamps giving 3½ watts per candle at the end of 1000 hours, having regard to the paper which Mr. Preece read at the recent British Association meeting at Liverpool. Mr. Preece gave a large number of series tests which he had made of electric lamps—for efficiency, duration, and so on. There was a group of 16-candle power lamps which at the end of 1000 hours, gave an efficiency of 68·3 per cent., another gave 62·39 per cent.; and the best group 83·7 per cent.—the general average being 73 per cent. Then he made an installation test, in which he kept 18 lamps going for 1000 hours in nine groups of two lamps each, in parallel. During this time there were as many as eleven of the lamps broken and replaced; and at the end of 1000 hours the average illuminating power was 9·6 candles, and the average consumption at the finish was a little over 5 watts per candle per hour. They were justified in taking into account that electric lamps did not maintain their efficiency constantly; and, therefore, they could not be compared with gas-burners, which, whatever their original quality might be, once put into position would give the same result if supplied with gas of the same value. He quite agreed with Mr. Gibbings as to the necessity of taking some fixed and determined theoretical standard for making a comparison; and this was what he had endeavoured to do. Of course, he had taken it on the gas side, for the benefit of gas people—that was to say, he had reduced the lighting value of electric lamps to something understandable on the gas basis. But it would be quite as easy to bring the gas down to the electric light basis. It would only be a conversion of terms. The fair and reasonable average rate of consumption for the electric lamps must first of all be determined. He took it at 4 watts, which he thought a very fair average. He did not bring the paper forward with the view of setting up a triumph of gas over electricity on the point of cheapness. As he had said, there were many things to be taken into consideration which it was very difficult for them to do from their standpoint, unless they went into the consumers' premises and made their comparisons there. This would, of course, make it in the end more satisfactory for a consumer to pay more for an electric lamp than for a gas-burner. A friend of his in Manchester, to whom he showed his figures, remarked that they might be perfectly right, and that the electric light did cost so much more in proportion to gas; but in many instances it would be cheaper to use the electric light—meaning that it would be more convenient and more satisfactory in many respects, and in many indirect ways bring an advantage from which they would reap benefit. He was much gratified with the discussion, and hoped it would lead them all to see what they could do with the intrinsic energy of gas.

The other papers—viz., "Illuminating Power as Exhibited in the Parliamentary Returns," by Mr. T. Newbigging, and "Notes on Sulphate of Ammonia," by Mr. T. N. Ritson—were then read and discussed. We give the papers elsewhere; and the report of the discussions thereon will appear next week.

The Forthcoming Gas Exhibition in New York.—In previous numbers of the "JOURNAL," preliminary notices have appeared in regard to the proposal to hold a Gas Exhibition in New York early next year, and which it is gratifying to learn is having the unqualified and active support of gas men in America who are identified with the industry either as engineers or investors. The arrangements for the exhibition are under the control of a Company incorporated for the special purpose under the title of the "Gas Industries Company," with offices at No. 280, Broadway, New York. The Managing Committee of the Company are wishful to secure something in the way of an historical exhibit from the older countries of Europe, embracing articles that would be of interest to students as well as practical workers—for instance, articles connected with the manufacture and distribution of gas that have been supplanted by newer and more efficient appliances, serving to show the advancement and progress of the gas industry. Among others who have been approached with the object of securing this result, is Mr. J. W. Helps, of Croydon, the President-Elect of the Southern District Association of Gas Engineers and Managers; and he has kindly consented to act as intermediary for the receipt and forwarding of such articles as those referred to. He will be glad to receive communications from anyone willing to lend assistance, so as to carry out the objects the American Committee have in view; but as time is short (the exhibition opening on Jan. 27) prompt action must be taken in the matter if anything effective is to be accomplished. All expenses attached to the transit, insurance, and return of any goods sent would, of course, be arranged for by the Committee of the exhibition; but particulars in this matter would be forwarded by Mr. Helps to anyone intending to assist.

DOMESTIC ILLUMINATION BY MEANS OF GAS.

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The use of coal gas for domestic illumination is so important a factor in most of our households, that it might be expected that a fairly general knowledge would exist as to the principles upon which efficient illumination depends; and yet there are few subjects upon which cruder and more erroneous ideas are to be found, not only among the public, but even among many who are supposed to have made a special study of the questions involved.

When, about the middle of this century, the Legislature began to attempt to safeguard consumers of gas, it was done by prescribing a certain standard of illuminating value to the gas; this being determined by the photometric methods then in vogue. This value was called the "illuminating power of the gas;" and up to a few years ago it was looked upon by most people as expressing the amount of illumination to be procured in practice from the gas, and the illuminating power as obtained by photometrists from various burners as representing the illumination to be derived under ordinary circumstances from those burners. Both of these assumptions are incorrect, and have given rise to a chaotic bemuddlement in the theory and practice of illumination. During the past five years, it has been gradually realized by many that "illuminating power" and "illuminating effect" mean two totally different things. This apparent anomaly depends upon several distinct factors. In the first place, illuminating power or illuminating value is merely a technical method of expressing the ratio of light emitted by the combustion of a certain sample of gas as compared with the light of the standard candle, and has but little to do with the effect produced, when the gas is consumed under conditions differing from those under which it was tested.

The fact that this has not been universally recognized has arisen from the duty of the gas engineer ending with the distribution of his gas, while the methods of burning it have been entirely left to the gas-fitter or the consumer; the result being that, while the former has looked upon the fulfilment of his statutory obligations as being the final object to be aimed at, the consumer, with the vaguest notions as to what the technical statement as to illuminating power means, has assumed that it represented the illuminating effect to be obtained from the gas. Indeed, where the consumer has taken the trouble to find out what is meant when he is told that he is supplied with 16-candle power gas, he learns that it means that, when the gas is burnt at the rate of 5 cubic feet per hour in the "London" argand, it emits a light equal to 16 sperm candles, each consuming the sperm at the rate of 120 grains per hour. He, therefore, assumes that, by burning his gas at the rate of 5 cubic feet an hour in a "London" argand, he gets the same illuminating effect in his room as if he had utilized the 16 sperm candles. Observation, however, would soon convince him that this is not by any means the case; and that, if he distributes his 16 sperm candles judiciously in his room, the illuminating effect produced is far superior to that of a London argand burner emitting the same amount of light from a gas-bracket in the centre of the room.

This simple instance strikes the key-note of the difference which exists between illuminating power and illuminating effect. In the one case you have sixteen centres of light, each illuminating a certain portion of the room, and none of them sufficiently intense to form a contrast with the others; while with the argand burner emitting its 16 candles of light from one small cylinder of flame, you have an area of brightness in the centre of the room, which throws the surrounding portions into comparative darkness, though they may be illuminated to an extent which without the brilliant contrast would appear to be sufficient and satisfactory.

Before discussing the question of the factors necessary to give satisfactory illumination, it will be well to glance at the photometric methods at present practically in use for measuring the illuminating value of gas. Many systems of doing this have been from time to time suggested; and from François Marie's attempt, in 1700, to measure the illuminating value of flames by trying how many pieces of glass had to be placed in the path of the rays in order to entirely cut them off, down to the present day, a large number of different expedients have been proposed. All the photometers, however, now practically in use for official gas testing date from 1843, when Bunsen first introduced the idea of measuring the relative intensities of light by equally illuminating the two sides of a piece of paper with a grease-spot in the centre, and then calculating the relative intensities by the distances at which the opposing sources of light had to be placed from the screen.

The principle of Bunsen's method of measuring the equality of light is that, if a portion of a sheet of paper be waxed, the part greased is more translucent to light than that which has not been so treated; and consequently, when a light is placed on one side of the paper, the greased portion stands out in a very marked manner as a bright spot on a dark ground. If now a second source of light be placed on the other side of the paper, the grease-spot will appear bright on the side opposite to that on which the strongest light is placed. If, however, the two lights are so arranged that each side of the paper is equally illuminated, the spot will practically disappear, or the spots on the two sides will appear of the same brightness. The bunsen disc made on this principle consists at the present time of a circle of ungreased paper in the centre of a waxed disc. These discs are made by mounting them on a thin steel axle revolving at a high rate of speed. During rotation, a vessel containing wax dissolved in a volatile solvent is brought in contact with them, and the paper is submerged in the liquid to a suitable depth; the result being that a small circle of paper remains unwaxed in the centre of the disc. The excess of solution being removed, and the solvent allowed to volatilize, the discs are taken off the spindle, and are ready for use.

Besides the bunsen disc with the plain circle, another variety, known as the Leeson or "star" disc is sometimes employed. In this disc, two pieces of paper are fixed, one on either side of a thicker piece, out of the centre of which a star-shaped figure has been cut. Difficulty was at first experienced with this disc, as the thin paper was apt to warp, and so present an uneven surface. This drawback was overcome by Mr. Dibdin, who fastened the papers together with thin starch water, and dried them under pressure; and in this way the warping and buckling of the paper was avoided.

The bunsen disc has the disadvantage that, when two lights of different colour are under trial, it is very difficult to find when the disc is equally illuminated. But the star disc does not possess this defect in so marked a degree; and lights of different tint can be compared with much greater ease.

A peculiarity sometimes met with, even in discs of the best construction, is that the sides give somewhat different readings; and consequently this may lead to the introduction of grave errors. If, however, during the tests, the disc is reversed, and half the readings made with it in each position, by taking the mean of the two sets of readings this error will be practically eliminated. If the discrepancy on reversing should be very great, the disc must be discarded; and in every case the surface of the disc in use must be protected from dust and dirt as much as possible, as the greasy surface is able to fix dust on it, and a new disc must be employed when the old one shows any sign of discoloration or irregularity in working.

After the introduction of the bunsen disc, photometers began to be made in various forms. The first instrument consisted of an open bar 100 inches in length; and the disc was fixed in a frame which could be moved backwards and forwards. At one end of the bar the standard burner was placed; and at the other end was the candle. Dr. Letheby fitted the disc in a small box open at the ends to the sources of light; an opening being made in the front to allow the observer to view the disc, which was placed in the centre of the opening at right angles to the line of sight, and between mirrors placed at such an angle that the two sides of the disc could be seen at the same time by the observer standing in front of the box. In place of the single candle, two flames were employed; these being obtained from two halves of the same candle.

The candles used for testing gas, being moulded candles, are slightly taper, in order to facilitate their removal from the mould in which they are formed; and accordingly the quantity of sperm consumed as the candle burns will be constantly altering. If the candle be cut in half and lighted at the middle, one half will burn down to the thick end, while the other burns to the thinner end. Thus the differences in the diameter will be compensated for. The candles are suspended in a holder on a small balance, so that the amount of sperm consumed during the testing can be accurately determined; and existing regulations only admit of those candles which consume more than 114 or less than 126 grains of sperm per hour as being "standard candles." The length of the bar was also reduced by Dr. Letheby from 100 to 60 inches, which may or may not be an advantage, according to the state of the atmosphere. On a 100-inch bar, the length of travel for the disc was considerably longer for an alteration of illumination than on a 60-inch bar; and for this reason the 100-inch bar was an advantage. But in foggy weather, or in an atmosphere containing a large amount of suspended matter, it is evident that the longer the bar the greater will be the interference of the atmosphere with the amount of light falling upon the disc. But if the standard and the light to be tested are nearly of the same value, the chance of error due to this source will be greatly reduced, in which case more accurate determinations could be obtained from the 100-inch bar.

The "closed Evans" photometer was introduced in 1858. It consisted of a large box enclosing the candles and the light to be tested, and differed from the former open bar photometer in the disc being fixed, and the candles being mounted on the balance which travelled backwards and forwards by means of an endless cord attached to a small winch. This form of photometer was designed for open-air testing; and every precaution had to be taken against draughts affecting the candles or the gas-flame. Its introduction into photometer-rooms was a mistake, as the want of thorough ventilation and the heating effects of the walls of the box upon the larger flame, caused the results to be slightly in favour of the latter. This objection was, however,

partly overcome by improving the ventilation at the two ends at which the candles and gas are burning, as is done in the "tower" photometer. But where a darkened room can be obtained, the open bar is undoubtedly the best, as the smallest check to the free passage of the air to the flame causes a slight increase in the products of combustion, and a corresponding influence upon the light emitted by the flame; and the tendency being to act upon the smaller flame more than upon the larger, the results cannot be relied upon.

The question of the standard light by which the value of coal gas is to be tested in the photometer has been so fully discussed before the Society within the present year, that it seems hardly worth while to again go deeply into the matter. I will therefore only briefly indicate the propositions which have been made during the past 45 years, and the present state of our knowledge on the subject.

The candle has been recognized as the legal standard ever since its introduction by Bouguer as a unit of light. But the results which are obtained from it in practice do not in any way attain the scientific accuracy which ought to prevail; and while the standard does not yield accurate results, it is of little avail to try to attain perfection in the remaining portions of the apparatus used for testing the quality of the light. Wax candles were first enacted to be employed for gas testing in the year 1850, before which date there had been no definition as to what candles were to be used; but these gave way to sperm candles of six to the pound, and burning 120 grains of sperm each per hour. The light yielded by these candles was a little more than that obtained from the previous wax candles—14 sperm being equal to 16 wax candles. Pure spermaceti, owing to its crystalline character and consequent brittleness, could not be used alone in practice. Accordingly, the sperm was mixed with 4 to 5 per cent. of beeswax; and great care has to be taken to get the quality of the sperm and the proportions of the mixture uniform. The wick is, however, the weakest point; a slight variation in the roughness or smoothness of the material, the preliminary treatment of the fibre, the twist of the thread or its tension during plaiting, causing great alterations in the light emitted by the candle.

All the various Committees appointed to consider the question of a reliable standard of light have unanimously come to the conclusion that the sperm candle cannot in any way be regarded as an accurate standard. Nevertheless the candle holds its own as the legal unit of light, owing largely to its convenience, and the difficulty of providing another standard which shall be as handy to use and which will be more reliable under ordinary circumstances.

To obviate the inaccuracy of the sperm candle, many attempts have been made from time to time by the Metropolitan Gas Referees to ensure more uniform results. The candle was first of all to be lighted at least ten minutes before the test was made, at the end of which time the wick was to have a glowing tip at the end of a slight bend, as when this condition is attained the candle will be burning at its normal rate. Later on it was prescribed that all testings were to be rejected in which the consumption of the sperm was more than 126 or less than 114 grains per hour. In 1889, the relative positions of the candles and their wicks were clearly defined, and the observer was further directed to employ a fresh candle for each test; while in September, 1894, minute regulations for securing, as far as possible, uniformity in the standard candles, by attention to the material and treatment of the wicks and sperm, were added to the Gas Referees' Instructions. All candles issued for official gas testing in London are at present examined and certified for use by them.

In spite of these precautions, however, the candle still remains an unsatisfactory standard; and, in consequence, many other forms of standard have from time to time been suggested, among which may be mentioned the Keates lamp, introduced in 1869, which was practically a modified form of the moderator lamp. This lamp, when burning sperm oil at the rate of 925 grains per hour with a 2-inch flame yielded a light equal to 16 candles. This lamp was modified by Mr. Sugg, who added to it what was practically a Methven slot; and it gave more constant results than had been obtained from candles. But its general performances were not good enough to warrant its adoption. The French standard of light is the carcel lamp, dating from the year 1800. It burns refined colza oil at the rate of 42 grammes per hour; the light given equalling 9·5 English candles. The standard due to Herr Hefner-Alteneck consists of a lamp burning the vapour of amyl acetate; the wick being contained in a round German silver tube, 8 mm. in diameter and 25 mm. high, and so regulated as to produce a flame 40 mm. high. This lamp ought to yield a light equivalent to one candle; but Mr. Dibdin found that the flame had to be increased in order to equal the light which was emitted by the Methven screen. The red colour of the flame, which renders the task of comparing the light to be tested a difficult one, is the great drawback to this standard. Another standard was proposed by Violle; but its impracticability rendered its use impossible, as he proposed to employ the light emitted by one square centimetre of platinum at the point of fusion.

The Methven screen, first introduced in 1878, is one of the most convenient forms of standard that have been proposed; and it is largely used in gas-works at the present day. It consists of an upright metallic plate fixed in front of a "London" argand burner. This plate has an orifice which is covered by a slotted silver plate, the opening in which is of such size that a quantity of light equal to that afforded by two average standard sperm candles is allowed to pass through when the gas-flame is 3 inches in height. It is only within certain limits that one can get a constant light from a small portion of a gas-flame; and though these limits are well within the illuminating value of the London gas supply, it is better to obtain greater constancy by using an aperture of smaller area, and carburetting the coal gas with pentane.

The standard proposed by Mr. Vernon Harcourt in 1877, and described at the meeting of the British Association in that year, was an entirely new departure. The burner consists of a brass tube, 4 inches in length and 1 inch in diameter; the upper end being closed by a brass plug, $\frac{1}{2}$ inch thick, in the centre of which is a round hole, $\frac{1}{4}$ inch in diameter. Surrounding the tube is a glass cylinder 6 in. by 2 in., the top of which is level with the top of the burner. At a height of 62·5 mm. above the burner is stretched a piece of platinum wire from 2 to 3 inches long, and about 0·6 mm. thick. The air which has been carburetted with the pentane is passed through a small meter, which registers one-sixth of a cubic foot at each revolution, and then through a governor, which regulates the supply to half a cubic foot per hour. The height of the flame is so adjusted that it appears to touch the platinum wire, but not to pass it; the platinum being fixed directly above the flame, and extending $\frac{1}{2}$ inch on either side of it. A special gas is used in this burner. It is made by mixing in a gasholder air and liquid pentane in the proportions of 1 cubic foot of air and 3 cubic inches of pentane. The latter is obtained from light petroleum, which is distilled at 60°, 55°, and twice at 50° C., and has to answer to the test of only faintly colouring 1-20th of its own bulk of fuming sulphuric acid on agitation with it for five minutes. The density of the liquid must be between 0·62 and 0·63 at 62° Fahr.; it must volatilize at ordinary temperatures without leaving any residue when the tension of its vapour is not less than 7·5 inches of mercury; and its vapour density, as compared with air, must be not less than 2·47 or more than 2·53. The chief drawbacks to this standard are that the personal equation of the observer affects the unit of light to a considerable extent—it being difficult for two observers to fix the flame at the same height; while the flame is also largely affected by vibrations and draughts.

After all the endeavours to obtain a standard burner which shall emit a constant light of small intensity, the opinion is generally gaining ground that it is preferable to employ a standard light which shall nearly approximate to that yielded by the flame undergoing comparison. To meet this requirement, Mr. Dibdin has devised a 10-candle pentane argand which consumes gas carburetted with pentane or a mixture of pentane vapour and air similar to that employed in the Harcourt unit. The argand burner is of special construction, giving a very full-bodied flame, the top of which is cut off by a screen, exposing a fixed height of flame. This burner, from the constancy of the results obtained by its use, its ease of manipulation, and the small extent to which it is affected by external causes, is the standard recommended by the Photometric Committee of 1891-4; but its adoption in place of candles has not yet been effected.

Coal gas, during the testing of its illuminating value, has always to be burnt at a fixed rate of flow—5 cubic feet per hour. This acts very well within certain limits of illuminating power; but if the gas falls below 15½ candles, it has a very prejudicial effect on the results obtained. The height of the flame also is an important factor, as the size of the chimney is calculated to supply the correct amount of air for a 3-inch flame. If a shorter flame is being tested, combustion is overdone, with the result that a depreciated reading is obtained. If, however, the gas be richer, and the flame consequently longer, a false record will again be the result, as an insufficient supply of air is brought in contact with the flame.

It is evident from these considerations that both the photometers and the standards in use are capable of considerable improvement; while another source of error lies in the fundamental method upon which all such measurements depend. When the distance of the flame to be tested and of the standard have been so arranged that the disc is equally illuminated on both sides, the illuminating value is found by taking the ratio existing between the squares of the distances at which the light-emitting sources have to be placed from the disc. The law of inverse squares, upon which this procedure is based, may be stated as follows: If the medium through which the light is passing is transparent, the intensity of illumination which a luminous point can produce on a white surface directly opposed to it is inversely as the square of the distance. It is manifest that this law will only be absolutely true when the source of light is a point; whereas in all photometric measurements the source of light to be measured consists of an area varying from 1 to 4 square inches in size, while the standard candle will give a far smaller area. At first sight, it appears as if this must be a grave source of error; but when the extent of the error comes to be mathematically calculated out, it is found to be excessively small as compared with the errors introduced by bad forms of photometers and faulty standards, as, while the standard and the light to be measured are at a reasonable distance from the screen, the error introduced by an extended area instead of a point is extremely small, and will not affect the accuracy of the

results to any appreciable extent unless one or other source of light be brought within a distance of 7 inches from the screen. Directly, however, this limit is reached, the error increases with such enormous rapidity that the results obtained would have to be discarded. This is one reason why it would be far preferable to test a flame by a standard which, as nearly as possible, would approximate to it in size, as in this case the error due to this factor would disappear. This is a strong argument in favour of adopting the Dibdin 10-candle standard as the one by which the illuminating power of London coal gas, as determined in the "London" argand, should be tested.

Attacks have from time to time been made upon the use of the law of inverse squares; but there is no doubt that, for all practical purposes, it may with safety be used photometrically, with the above reservations. It must, however, be apparent that, as the source of light is neither a point nor a uniformly illuminated surface, the amount of light emitted by a flame will probably vary considerably according to the angle at which the rays are falling. That this is so, was pointed out by Mr. Dibdin some years ago. It must also be borne in mind that the photometer only measures the relative intensity of the direct rays emitted by the flame—every precaution being taken to shut off reflected light; whereas, in the lighting of a room, the light thrown back from the walls and ceiling plays a very important part, and that reflected by the object on which it falls will also vary with the angle at which the rays strike that object.

The result of this is that, though the values recorded by the photometer give a ratio of value for the direct rays falling on surfaces in the same horizontal plane as the source of light, they tell us absolutely nothing as to the combined value of the direct and diffused light cast upon the book or any working surface, which, as a rule, will be at an angle varying from 45° to 90° below the flame. The direct rays are those which, radiated from the luminous source, fall directly on the object illuminated, whereas diffused light consists of those rays which have been reflected from one or more surfaces, or which have been refracted by passage through media of varying density. As photometry only deals with the primary source of illumination, and that, as a rule, only on the horizontal plane, it is absurd to suppose that such records of illuminating values can be worth anything as indications of the illuminating effect arrived at in practice.

The ordinary classes of burners in domestic use for the consumption of coal gas are the argand, the flat-flame, the regenerative, and the incandescent. The "London" argand may be taken as the type of the first class; the union-jet and the batswing, of the second; the Wenham, Siemens, or "Cromartie," of the third; and the Welsbach and Sunlight mantles of the last. These burners have all been tested upon a radial photometer in a darkened room, in which all objects were carefully blackened so as to ensure absorption of all rays not falling on the disc; and the following table records the results obtained:—

TABLE I.—*Illuminating Value of Various Burners at Angles below the Horizontal, in Terms of Candles per Cubic Foot* (16-*Candle Gas.*)

Angle. Degrees.	"London" Argand.	Union Jet.		Batswing.		Regenerative.	Incandescent.
		No. 5.	No. 7.	No. 5.	No. 7.		
Horizontal	3·20	1·67	2·09	1·90	2·43	3·4	16·6
10	3·19	1·62	2·08	1·84	2·42	4·8	16·6
20	3·07	1·55	2·03	1·73	2·38	5·3	16·1
30	2·72	1·45	1·88	1·61	2·25	5·8	11·1
40	2·38	1·40	1·64	1·47	2·18	6·0	8·8
45	2·18	1·30	1·50	1·38	2·12	6·2	8·0
50	2·12	1·27	1·50	1·38	2·05	6·5	6·6
60	1·20	1·23	1·50	1·30	2·07	6·7	2·0
70	*	1·23	1·37	1·23	2·00	7·7	*
80	,,	0·76	1·25	0·76	1·75	8·0	,,
90	,,	0·30	0·87	0·76	1·37	8·0	,,

* Unreadable.

In an ordinary dwelling-room, the gas-lights are, with few exceptions, so arranged as to be above the line of sight, so as to avoid irritating the eye. A moment's observation will convince anyone that the illumination shed upon one's book or writing is derived from a source from 40° to 90° above it; and it is manifestly the illumination given by the burner between these angles which is the important factor in domestic lighting. Turning to Table I., the marked inferiority of the standard "London" argand at once becomes apparent, as at an angle of 60° it is surpassed in illuminating value by even the small flat-flame burner; and the rule-of-thumb practice which has made this kind of burner the popular method of illumination is fully justified as long as we have only the flat-flame and the argand to choose between. When, however, we come to high-power lights, such as the regenerative and the incandescent, we find that the latter, in spite of its overwhelming superiority in horizontal rays, is only equal to the regenerative when the working angle is reached; while below 60°, even the flat-flame burners surpass it in illuminating value, and the regenerative burner shows itself, for the general lighting of a room, still superior to any of its compeers, as, with horizontal rays equal to the "London" argand, it gradually gathers in illuminating strength the lower the angle becomes, until upon the table immediately below the burner a full flood of light is shed.

These results were obtained, as before mentioned, in a darkened room, the objects in which were blackened to prevent reflection; and therefore they represent the direct rays only, and allow nothing for reflection. It will be justly argued that, with such intensity of light as is given by the incandescent mantle, the reflections from the highly-lighted portions of the room would compensate for the loss of direct rays in the downward direction. In order to see how far this might be so, a fresh set of tests was made between the angles of 45° above and 45° below the horizontal—first in the darkened and blackened room, and immediately afterwards with the same mantle in a room with light distempered walls and white ceiling; care being taken to prevent light escaping into the room from the standard burner used. Under these conditions, the following results were obtained:—

TABLE II.—*Candle Power per Cubic Foot of Gas.*

Angle. Deg.	With Blackened Ceiling and Walls.	With Light Ceiling and Walls.
45	8·75	11·23
40	9·72	11·80
35	11·28	13·26
30	12·25	14·90
25	13·22	15·01
20	13·60	15·30
15	14·58	15·53
10	14·97	15·71
5	14·97	16·13
Horizontal	14·97	16·34
5	14·58	16·34
10	13·60	15·93
15	12·43	14·30
20	11·28	13·26
25	10·69	12·60
30	9·72	11·23
35	7·78	10·21
40	6·22	9·19
45	5·05	8·60

In these experiments, it will be noticed that the mantle used gave a slightly lower illuminating value than the one employed in the previous set; but as the same mantle served both in the darkened and in the normal room, the results obtained may be taken as a true indication of the effect due to reflection for this particular source of light, which, being exceptionally intense, gives a much larger percentage of general illumination from this cause than would be found to be the case with lights of less intensity.

It will be seen that, on the horizontal plane, the increased effect due to reflection is comparatively small, and only amounts to 9 per cent.; whereas at 45° above, reflection increases the illumination by 28 per cent., and in the downward direction the increase at 45° is no less than 70 per cent. This result, however, might be expected when one considers how much greater the reflective power of a white ceiling is than that of a boarded floor. The difference would, of course, be far greater with dark furniture and a carpeted floor, which would reduce to a minimum the reflection helping the upward rays, while the downward reflection would remain practically the same. With feeble sources of light in a fair-sized room, the increase of light due to reflection becomes almost negligible. On making an experiment with the "London" argand burner under the same conditions as those used with the incandescent mantle, it was found that the increase given by the light walls and white ceiling was only 3 per cent. on the horizontal, and 1 per cent. at an angle of 45°. In practice, this trouble has to a great extent been met by the use of reflectors and globes of special construction, the results of which will be discussed in a future lecture.

It is evident from these experiments that, where the illumination is required for the table, the regenerative burner immediately above it gives by far the best results; while the flat-flame burner is still the one best adapted for use in chandeliers. If, however, the general illumination of the room is aimed at, the incandescent mantle may be employed; but it must be attached to brackets on the walls of the room, and not be used in overhead chandeliers.

While admitting the usefulness of photometric observations on the horizontal plane, as giving a basis for legislative enactments as to the equality of an illuminating gas supplied to a town, I think the time has now arrived for a more general recognition of the fact that the values so obtained are useless for giving any indication of the light which a consumer may expect to develop from it. The so-called 16-candle coal gas supplied to London is made to yield on the horizontal plane anything from 8 to 80 candles of illumination, according to the burner used for its consumption; while at the angles ordinarily employed, startling modifications of these figures again take place. With most burners, the light afforded at an angle of 45° remains fairly constant up to an angle of 60°; and I think it would be a valuable step forward if, in comparing the light-emitting value of various burners, the light radiated at the working angle of 45° were always employed, instead of the misleading results obtained on the horizontal plane.

This is, in my opinion, one of the chief causes also of the discrepancies existing between illuminating power and illuminating effect. Other factors less easy to deal with are: (1) The difference in effect caused by the variations in the size of the source of light; (2) the effect of distribution and intensity of the sources of light on the visual organs; and (3) the reflecting power of the surrounding objects.

The size of the source of light has an important influence on

the illuminating effect. If a large flat flame of coal gas and a small high-power flame of oil gas or acetylene of the same illuminating value be placed at equal distances from a rod, and the shadow of the rod be then received on a white screen fixed at some distance from the rod, the shadow due to the large flame will be seen to have soft undefined edges, while that from the small flame will be sharp and hard; so that, though in each case the depth of shadow may be equal, the one will be far less striking to the eye than the other. This causes the illuminating effect of the large flame to be better than that given by the small one. Another important point is that the larger the surface from which the given amount of light is being emitted, the less will be its intensity for any specified area, and the less the deadening and irritating effect upon the optic nerve. The smaller and more intense the light-emitting source, the greater will be the contrast between the highly illuminated area immediately surrounding it and the less well illuminated parts of the room at a greater distance from it, which, to the eye fatigued by the intensity of the central illuminant, appear almost in darkness.

The best system of illumination for the living-rooms of a house is undoubtedly to have the source of light so placed as to be well above the plane of vision, and yet sufficiently intense to flood the room with soft light; and it is the possibility of obtaining this with ventilating regenerative burners fixed in the ceiling that renders this mode of lighting at once the best and most healthful that can be used for dining and sitting rooms. It is, however, only the ventilating form of these lamps to which this applies. If a non-ventilating regenerative lamp is employed, it comes too far down into the room to be fit for use in any but an unusually lofty apartment, as, under ordinary circumstances, the heat thrown out is a serious drawback.

Where structural or other considerations prevent the use of ventilating lamps, the great aim in effective lighting should be to subdivide the source of light as far as possible. In the same way that 16 candles scattered about a room give a far more effective illumination than one 16-candle argand burning in the centre, so in a large space twenty 14-candle flames give a far better effect than ten 28-candle flames, and these latter again surpass one centre of light equal to 280 candles.

If it is desired to use small and intense light-centres such as incandescent mantles or acetylene flames, then, not only for illuminating effect but also for the sake of the eyesight, we must adopt means for diffusing the intensity of the light-source over a larger surface, which shall itself become the light-emitting centre. The means available for doing this will be discussed when we come to consider, in a subsequent lecture, the effect of various forms of globes in use.

Illuminating effect, not being due to any one factor acting alone, but to the combined effect of at least four, one or more of which will vary with the particular environment as well as with the source of light, can only be measured where it is produced; and no calculations can give even an approximation as to the result. Instruments for measuring the amount of illumination received at some given point have been devised by Preece, Mascart, Trotter, Sugg, and others, and have yielded valuable data; but our knowledge is still too incomplete to allow of any very definite laws being laid down.

In the spring of this year, some interesting experiments were made by Major G. K. Scott-Moncrieff, of the School of Military Engineering, Chatham, on the suitability of the various burners commonly in use for the illumination of the interiors of barracks and other buildings of a similar nature. He took as a starting-point the fact that it is possible to look up a train in "Bradshaw" with a light of 0·16 candle-foot, provided the eyesight is good, and that therefore 0·2 candle-foot is sufficient for any ordinary work of a character likely to be done after dark.

Experiments were then made in a soldiers' barrack-room 40 feet long and 20 feet wide; and the source of light having been fixed 8 feet above the floor, the illumination on a horizontal plane 2 feet above the floor was determined by a specially constructed photometer. The height of 2 feet was fixed upon as being that of a man's knees when sitting on a chest or cot, and the lowest level at which printed matter would be read; and the area of the portion of room on that plane at which the illumination was 0·2 candle-foot or higher was taken as satisfactorily illuminated. The practical results are shown in Table III, and the conclusions arrived at were—

1.—That the present illumination by means of No. 5 Bray burners is wasteful of gas and inefficient as regards illumination.

2.—For barrack-room use, however, the common Bray burner may be retained, if used with caps, and grouped as in the Stott-Thorp arrangement. This may in some cases be extravagant in gas; but the illumination is good, the arrangement is not easily damaged, and ventilation is assisted.

3.—For reading-rooms, sergeants' messes, officers' messes, and other accessory buildings, the incandescent light is the best illuminant.

4.—For places where the light-source is situated some height above the floor—as, for example, in gymnasia, lecture-halls, and churches—regenerative lamps give very satisfactory results.

TABLE III.—*Results of Experiments in the Illumination of a Barrack-Room.*

Name of Burner.	Total Gas Consumption per Hour. Cubic Feet.	Illumination.
Two Brays	16·0 ..	Whole room insufficiently lighted. Nowhere possible to read small print 6 feet below gas-lamp.
Two flat-flame, fitted with caps	11·4 ..	About one-fourth working space illuminated.
Two Stott-Thorp reflex lights	18·0 ..	Eight-tenths of working level efficiently lighted.
Two Sugg workshop lights .	16·0 ..	About one-fourth working space efficiently lighted.
Siemens regenerative . . .	11·0 ..	Whole room well illuminated.
Deimel regenerative . . .	9·0 ..	Two-thirds of working space efficiently lighted.
Two Schulke lamps . . .	10·0 ..	Practically whole working space illuminated.
Welsbach incandescent, with glazed conical reflector .	4·3 ..	Whole room brilliantly lighted.

Every interior requires the illumination to be arranged for the special purposes in view. For the dining-room, the illuminant must give a soft flood of light on the table, and yet be sufficient to light the sideboard and the floor space; in the workroom or the office, a strong local light is required on the bench or the desk, and the remainder may be subdued light; while the sitting-room calls for a uniform illumination that shall light up the pictures and cornices as well as the tables and floor. In all cases, the source of light should be well above the level of the eye. To my own taste, nothing can be better or more healthful for dining and living rooms than the ventilating regenerative burner; while as bracket lights, incandescent gas-burners of a warm tint may be effectively employed. In bedrooms, man dare not dictate the form of illuminant; and the convenience of flat-flame burners on brackets for heating curling-irons will probably ensure their supremacy. But whatever be the method of illumination, intense centres of light and harsh shadows should be avoided if you desire a proper illuminating effect.

ILLUMINATING POWER AS EXHIBITED IN THE PARLIAMENTARY RETURNS.

BY THOMAS NEWBIGGING.

[A Paper read before the Manchester District Institution of Gas Engineers, Saturday, Nov. 28.]

Anyone perusing the yearly Parliamentary Returns relating to Gas Undertakings in the United Kingdom, must be struck with the great differences which exist, in the majority of instances, between the *prescribed* illuminating power and the professed *actual* illuminating power of the gas supplied both by Companies and by those Local Authorities who own the gas-works in their respective towns.

I have been at some pains to look into the figures as regards this question of illuminating power exhibited in the Returns, with a view to ascertaining the money value of the concession thus made to the gas consumer; and it may be interesting and instructive to you to have the result of my investigations. I have taken the latest Returns—viz., those for 1894 for the Companies and to March, 1895, for the Local Authorities—for my text; and I have limited my inquiries to England and Wales.

The total number of statutory Gas Companies is 417; and of Local Authorities owning gas-works, 157. The prescribed minimum illuminating power of the gas supplied by these is as follows :—

Prescribed Illuminating Power in Standard Candles.	Companies. Number.	Local Authorities. Number.	Total Number.
10 ..	6 ..	— ..	6
12 ..	8 ..	6 ..	14
13 ..	2 ..	— ..	2
14 ..	240 ..	72 ..	312
15 ..	123 ..	39 ..	162
15½ ..	2 ..	— ..	2
16 ..	23 ..	20 ..	43
16½ ..	1 ..	— ..	1
18 ..	3 ..	5 ..	8
20 ..	1 ..	1 ..	2
Not prescribed ..	8 ..	14 ..	22
Total . .	417 ..	157 ..	574

In order to ensure that the illuminating power supplied shall be well up to the standard, and so avoid the risk of being penalized for default, the gas sent out must be somewhat higher in value than the prescribed rate—say, one candle in excess—though, as a matter of fact, a margin of from one-third to half a candle suffices for the Gas Companies of the Metropolis, which are under regulations of the most stringent character. I have, however, assumed that the margin of excess may be put at one candle. For the purposes of my investigation, I have taken those works whose prescribed rates of illuminating power are 14, 15, and 16 candles respectively, as they represent the great bulk of the whole—viz., 517, out of a total of 574, or 90 per

cent. Taking, therefore, these works, I find that the Returns of the actual illuminating power supplied are as follows:—

TABLE, *showing Returns of Illuminating Power of Gas Supplied by Works having a Prescribed Rate of* 14 *Standard Candles.*

Companies. Number.	Illuminating Power of the Gas Supplied.	Local Authorities. Number.
7	14	3
9	14½	—
1	14¾	—
24	15	3
1	15¼	—
41	15½	1
3	15¾	—
57	16	11
2	16¼	2
24	16½	2
—	16¾	1
16	17	14
14	17½	10
1	17¾	1
16	18	10
5	18½	4
—	18¾	1
4	19	—
—	19¼	2
1	19½	3
—	20	2
—	20¼	1
14	not stated.	1
Total . . 240		Total . . 72

Together, 312.

TABLE, *showing Returns of Illuminating Power of Gas Supplied by Works having a Prescribed Rate of* 15 *Standard Candles.*

Companies. Number.	Illuminating Power of the Gas Supplied.	Local Authorities. Number.
1	14·82	—
8	15	2
3	15¼	—
19	15½	2
4	15¾	—
20	16	5
2	16¼	1
13	16½	5
14	17	7
—	17¼	2
11	17½	2
1	17¾	—
8	18	7
—	18¼	1
2	18½	1
4	19	1
—	20	2
13	not stated	1
Total . . 123		Total . . 39

Together, 162.

TABLE, *showing Returns of Illuminating Power of Gas Supplied by Works having a Prescribed Rate of* 16 *Standard Candles.*

Companies. Number.	Illuminating Power of the Gas Supplied.	Local Authorities. Number.
4	16	—
3	16½	1
4	17	—
2	17¼	1
2	17½	1
1	17¾	—
2	18	9
—	18½	4
4	19	3
1	20	—
—	not stated.	1
Total . . 23		Total . . 20

Together, 43.

Where fractional figures occur in the Returns—as, for example, 0·2, 0·46, 0·82, 0·95—I have taken the average as near as possible, calling them ¼, ½, ¾, and 1 respectively.

It will be seen that the proportion of Local Authorities returning the higher illuminating values is greater than that of the Companies. One Company (in the 15-candle table) has, with an excess of candour, returned its illuminating power as being *below* the prescribed rate.

Eliminating from the foregoing lists the works whose actual illuminating power is at the prescribed rates, those which do not exceed the prescribed rates by more than 1 candle, and also those which have failed to make a return, I find the quantity of gas sold by the remainder in terms of 1 candle excess illuminating power (beyond the 1 candle margin) amounts to 18,005 million cubic feet for the Companies, and 42,706 million cubic feet for the Local Authorities. This is made up as follows:—

Cubic Feet, in Terms of 1 *Candle Excess beyond the* 1 *Candle Margin.*

	Companies.	Local Authorities.
14-candle prescribed . .	14,042,000,000	25,312,000,000
15 " " . .	2,750,000,000	10,895,000,000
16 " " . .	1,213,000,000	6,499,000,000
Total . . .	18,005,000,000	42,706,000,000

Together, 60,711,000,000

The enriching medium generally employed is cannel, though oil is also used to some extent. Assuming 0·8d. per 1000 cubic feet as the cost per candle of the excess illuminating power (always allowing 1 candle as the legitimate margin), this quantity for the Companies amounts to £60,017, and for the Local Authorities to £142,353—together £202,370. If in my calculations half a candle only were taken by way of margin—as is found by the Gas Companies of the Metropolis to be sufficient—the excess value given to consumers would be increased to over £300,000 per annum.

There will, no doubt, be differences of opinion as to whether the policy, so widely pursued, of giving such a high margin of illuminating value beyond the statutory figure is a wise one.

The varieties in the prescribed illuminating powers are curious, and their *raison d'être* inexplicable on any reasonable hypothesis. Why, for instance, should Liverpool and Southport be saddled with a 20-candle, and Salford, Wigan, Preston, and Middleton with an 18-candle standard respectively; while most other Lancashire towns have to be content with a 12, 14, or 16 candle standard? This want of uniformity is largely the result of caprice, and has no solid basis of reason to justify it.

Such striking differences exist, not only between the prescribed and the actual rates, but also in the illuminating power supplied in different towns in the same county. It is not apparent why there should be such differences. To take a few instances: Why should the consumers in Accrington have only 17-candle, and those in Ashton-under-Lyne 19-candle gas? Croydon 15½ and Guildford 17? Stourbridge 15½ and Oldbury 16½? Hebden Bridge 17½ and Sowerby Bridge 18½? Bingley 16½ and Batley 18? Hull 16 and Bridlington 17¾? Knottingley 15 and Longwood 18? Salisbury 15 and Swindon 17½? In a word, if 16-candle power, or a fraction over, is good enough for London, surely it ought to be good enough for (say) Tyldesley-cum-Shakerley, where they profess to supply 18½-candle gas. There seems to be no kind of method in the madness of these variations.

It is to be presumed that the Returns are *bonâ fide*. Whether the illuminating power in all cases has been determined by the standard photometer is more than doubtful. Probably the indications of the jet photometer have been adopted in many instances; and though this latter instrument is useful as affording a comparative test from day to day, it is by no means a trustworthy indicator of the absolute illuminating value, and should not be employed as such. Any manager of a gas-works is badly advised in claiming the higher values given in the Returns, unless he has the fullest justification afforded by the standard photometer for his doing so. It goes without saying that, with these high illuminating powers professed to be supplied (say) of 17 to 20 candle gas, a company, in making application to Parliament for increased powers, is (especially if opposed) placed at a serious disadvantage when the prescribed illuminating power is attacked; and a Parliamentary Committee can hardly be blamed if, under such circumstances, they raise the standard. That is tantamount to the Company providing a rod to smite its own back. The Engineer of such a Company, when the prescribed rate is raised upon him, may be literally said to be hoist with his own petard; and he has thenceforward to groan under an intolerable burden.

That standards of 18, 19, and 20 candles are a grievous hardship, no engineer who has experience of them will deny. Such high qualities do not tend to lessen the number of complaints by consumers—on the contrary, they increase and aggravate them. Gas of this rich character is rarely burned to advantage; and unless it is, the inevitable blackening of the ceilings of rooms is attributed by the ordinary consumer to the foulness of the gas.

But what is to be thought of the promoters of a Gas Bill in Parliament voluntarily putting themselves under the yoke of an 18-candle standard? In the last session of Parliament, the Local Authority of a district, where the coal of such district does not yield gas of more than 16 candles value, actually undertook to give a minimum illuminating power of 18 candles! That their Engineer advised this, I do not believe for one moment. They probably adopted the standard at their own instance. The proposal is due simply to a lack of knowledge of the existing conditions of illumination. Practically, it means 18½ or 19 candles. Gas of such high illuminating value, when burned under normal conditions, is an anachronism in these days of regenerative and incandescent gas lighting, when, by the adoption of a simple and comparatively inexpensive expedient, a 15-candle gas can be made to yield from 50 to 150 per cent. more light than formerly.

Absurdities of the kind to which I have alluded would give fit occasion for amusement were it not that the matter has a serious side, inasmuch as it tends to unsettle the minds of consumers, and to that extent is an injury to the Gas Industry.

NOTES ON SULPHATE OF AMMONIA.

By T. N. RITSON, of Kendal.

[A Paper read before the Manchester District Institution of Gas Engineers, Saturday, Nov. 28.]

The continued decline in the market value of sulphate of ammonia has now reached a stage when it behoves producers, (especially gas authorities) to be up and doing. In 1891, the author read a paper before the Incorporated Gas Institute, upon "Sulphate of Ammonia as a Manure," wherein he endeavoured to draw attention to the fertilizing properties of this nitrogenous

material. He gave some practical results of its application upon potato culture, and its beneficial effects on other crops; and he also showed how farmers could expeditiously and profitably prepare manures for themselves on the farm.* Moreover, he urged upon the meeting the necessity for some combined action on the part of sulphate of ammonia producers (in conjunction with the Incorporated Gas Institute and the kindred Associations), for the purpose of taking up the question of "plot experiments" throughout the country, under the guidance of qualified practical agricultural chemists and farmers, in the belief that such tests would be of considerable utility to agriculturists generally, and would probably do more to popularize and extend the uses of this valuable nitrogenous material than all the literature which could be brought to bear upon the subject.

Although much has been done to popularize sulphate of ammonia by the dissemination of literature setting forth its manurial value, there is still a great want of practical tabulated records of a trustworthy character, showing the results obtained from its use upon various crops. Until something of the sort is placed in the hands of producers, whereby farmers can be shown conclusive proofs of its beneficial effects as a fertilizer, we cannot hope to succeed in creating that local demand so much to be desired. The experience which the author gained from the plot experiments conducted in Jersey a few years ago, has helped him materially in his endeavours to create a local demand in Kendal; and though it is uphill work, yet he has been rewarded with a measure of success. In the case of one farmer whom he has instructed in the preparation of artificial manures on his own farm, the results have been highly successful; the yields of potatoes and hay respectively being more than doubled. That farmer now makes all his own artificial manures; he is a constant customer; and though a comparatively small consumer, the knowledge of his success has spread to others, and slowly but surely the local demand is increasing.

There is no doubt that sulphate of ammonia is the nitrogen *par excellence* for compounded artificial manures. It can be mixed and stored; thereby enabling farmers to employ their skilled labour during the slack season in preparing manures for the spring. Mixed manures prepared with nitrate of soda cannot, however, be stored for any length of time, from the fact that it deteriorates and deliquesces. Consequently such manure has to be prepared at a time when skilled labour is otherwise fully employed; and the risk of improper mixing is liable to result in grave disappointment at harvest time.

The value of nitrogen in agriculture cannot be over estimated. Plants cannot thrive without it; and, moreover, the natural soil, with respect to this ingredient, is readily exhausted, and renewal with artificial supplies is costly, but at the same time absolutely necessary. The most concentrated forms of nitrogen are sulphate of ammonia and nitrate of soda. When it is considered that the three principal crops of this country—viz., wheat, oats, and barley—could do with all, and even more sulphate of ammonia than is produced in the United Kingdom, as shown by Table I., on the other hand, assuming that the 21,900,000 acres of land under cultivation in the United Kingdom (see Table II.) received only ½ cwt. of sulphate of ammonia per acre (a very moderate dressing), it would require about 550,000 tons, or three times the present production of the whole of the United Kingdom. Yet what do we find? Considerably more than one-half of the sulphate produced is exported to the Continent of Europe, and its place taken by another material (see Table III.), which, on the basis of the unit value of nitrogen, stands at the present time 25 per cent. above the market value of sulphate of ammonia. In other words, the nitrate of soda producers are obtaining £2 1s. 9d. more per ton than they should—and that at the expense of the consumer. With sulphate of ammonia at £7 12s. 6d. per ton at port, nitrate of soda (based on the unit value of nitrogen calculated as ammonia) should only be £5 18s. 3d. per ton; or, to put it another way, with nitrate of soda at £8 per ton, sulphate should be worth £10 6s. 4d. per ton. Still, farmers are willing to pay this increased price for an imported product; and at the same time they grumble about hard times and foreign competition, regardless of the fact that they have at their very doors a nitrogenous ingredient which is of equal fertilizing value to the imported material.

* By special request, this paper was reprinted in pamphlet form, for general distribution among farmers.

TABLE I.*

[Based on the Agricultural Returns for 1887.]

—	Bushels.	Containing Nitrogen.	Equal to Sulphate of Ammonia.	Equal to Nitrate of Soda.
		Tons.	Tons.	Tons.
Wheat	76,224,940	37,432	176,465	227,266
Barley	69,948,266	27,324	128,813	165,896
Oats	150,789,416	56,835	267,936	341,010
Total	296,962,622	121,591	573,214	734,172

TABLE II.—*Agricultural Returns of the United Kingdom for the Year* 1895.

Crops.	Estimated Total Produce.	Acreage.
	Bushels.	Acres.
Wheat	38,285,107	1,454,015
Oats	174,476,182	4,512,464
Barley	75,028,474	2,338,067
	Tons.	
Potatoes	7,064,634	1,251,703
Turnips	29,221,055	2,229,183
Mangolds	6,376,386	387,888
Hay (all kinds)	12,237,600	9,257,981
Other crops	—	512,965
	Total	21,944,266

TABLE III.—*Shipments and Consumption of Nitrate of Soda for* 1893, 1894, *and* 1895.

	1893. Tons.	1894. Tons.	1895. Tons.
Shipments	766,000	1,004,000	1,109,000
Consumption—			
Continent	643,000	734,000	805,500
United Kingdom	104,000	114,000	110,000
United States	100,000	100,000	100,000
Total	847,000	948,000	1,015,500

The question arises, what is the cause of the depression in the market value of sulphate of ammonia. Is it due to overproduction, or is there less demand? Table IV. (taken from Messrs. Bradbury and Hirsch's "Review of the Sulphate Market for 1895") gives the production, exports, and home consumption, &c., of sulphate for the past ten years.

TABLE IV.—*Production, Deliveries, and Exports of Sulphate of Ammonia,* 1886 *to* 1895.

Date.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.
Produced (tons)	106 500	113,700	122,800	133,000	134,000	143,000	150,000	151,500	160,000	171,000
Exported	79,000	81,500	83,000	87,000	86,000	90,000	105,000	112,000	103,000	112,000
Home consumption	25,500	30,400	31,300	41,000	42,000	43,000	42,000	37,500	41,000	39,000
Stock	2,000	1,800	8,500	5,000	6,000	10,000	3,000	2,000	16,000	20,000
Percentage on Production.										
Exports	74·2	71·7	67·6	65·4	64·2	62·9	70·0	73·9	64·4	65·5
Home consumption	23·9	26·7	25·5	30·8	31·3	30·0	28·0	24·8	25·6	22·8
Stock	1·9	1·6	6·9	3·8	4·5	7·1	2·0	1·3	10·0	11·7
Average price per ton	£11 3 7	£11 17 8	£11 18 0	£12 1 4	£11 9 0	£10 15 5	£10 1 10	£12 11 4	£13 3 8	£9 15 4

From Table IV., it will be seen that there is an increased production of 11,000 tons as compared with 1894, which is made up as follows: Gas-works, 2500 tons; iron-works, 1500 tons; and shale-works, 7000 tons—total 11,000 tons. This shows that the bulk of the extra production was from Scotland—brought about probably by the immunity from labour troubles. Compared with production, the exports show a slight falling off since 1893. The increased production from coke ovens in Germany may account for the decrease in the exports to that country, as it is a noticeable fact that Germany, Holland, and Belgium show a falling off of some 5000 tons as compared with 1894. Taking the year 1895 as a whole, however, the exports to the Continent show an increase of about 9000 tons over the previous year; but the home consumption, which has been on the decline since 1891, fell 2000 tons short of 1894.

From this it would appear that there is no diminution of the favour in which sulphate is held on the Continent. This fact is very marked in regard to Spain and the United States of America. The exports to the former have risen from 3000 tons in 1886 to 21,000 tons in 1895; and of the latter from 900 tons in 1886 to over 11,000 tons in 1895. Although the exports have fallen off some 8½ per cent. since 1893, it is no new experience, as the same thing has happened on previous occasions. But the market value has not hitherto been affected to the same extent as at present. The falling off in the home consumption, however, is to be deplored. Doubtless the severe winter of 1894, combined with the heavy stocks held over by manure manu-

* "Nitrogen: Its Uses and Services in Agriculture." By C. M. Aikman.

facturers, depression in agriculture, and the increasing competition and cheapness of nitrate of soda, may be responsible for this. One of the causes of the decline is, however, the readiness in which certain producers lend themselves to the policy of placing their forward makes upon the market, for a slight gain above current rates.

Mr. Chester, in his Inaugural Address before the Incorporated Gas Institute last June, laid special stress upon this point; and as his remarks thereon are worthy of more than passing notice, the author has permission to reproduce them—

> The fall seems to have been brought about entirely by "bear" operators taking advantage of the weakness and entire absence of united action amongst producers to sell forward at low prices in the certainty of being able to cover their engagements at their own prices when the time arrives. This exploiting of the markets by the middleman, whether it tends to the injury of the producer at one time, or to the fleecing of the consumer at another, is alike injurious to the best interests of the trade, to the popularization of sulphate as a fertilizer, and to the maintenance of steady values for the article. . . . . The weakness of the position from the producer's point of view is the readiness with which certain manufacturers can be induced to place their forward makes at a shilling or two above the current market values; thus discounting any possibility of a rise, and practically fixing prices for the future. So long as this continues, the speculator can pocket the orders as they arrive, and use the forward sales as a lever to force down the prices of the day to a still lower level. Practically, he holds us in the hollow of his hand. The remedy for this is for makers to resolutely set their face against selling portions of their make forward; to put the material on the market as it is produced; and to endeavour to cultivate the home trade with the consumers direct, or with the local manure manufacturer. Another remedy is to establish a more intimate relationship between manufacturers, to facilitate the exchange of information as to what each is doing and what prices are being obtained.

The "Chemical Trade Journal" for 1893, in reviewing the sulphate market, said:—

> Sulphate of ammonia is one of those few articles that can still be "manipulated," on account of the want of combination amongst the producers of it. . . . . If producers of sulphate of ammonia were only half as well combined as the "bulls" or "bears," there would be no such thing as sulphate sales six months ahead without a cover. But it suits the speculators very well to keep the producers apart, and in ignorance of one another's doings. . . . .

The author entirely agrees with these authorities; and he is convinced that, so long as the policy of selling forward exists, it will continue to have a depressing effect on the market, and practically leave producers in the hands of these speculators.

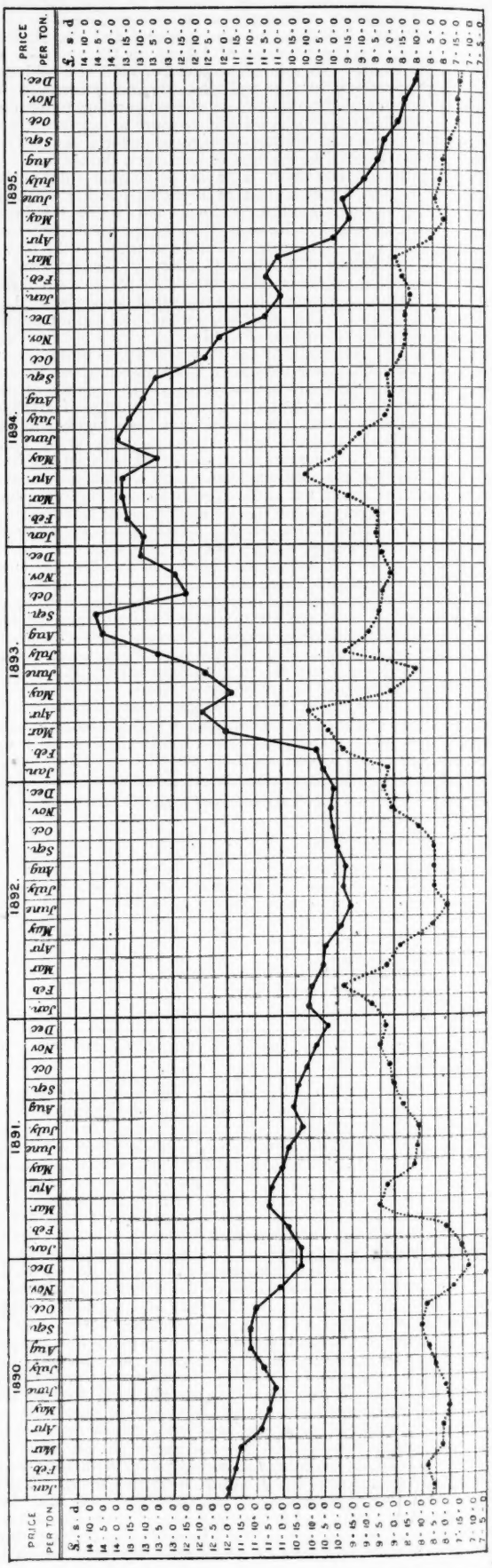
What is wanted is more united action on the part of producers. The Association of Sulphate of Ammonia Manufacturers was organized with this object in view; but for want of better support, it is only able to touch the merest fringe of the question. When it is considered that the value of the 180,000 tons, or thereabouts, of sulphate produced in the United Kingdom represents about £1,750,000 sterling, it will be at once admitted that the funds at present at the disposal of the Association are altogether inadequate to deal with a product of such national importance. If the sphere of usefulness of the Association is to be expanded, it ought to be better supported by producers, who should not rest satisfied until it is thoroughly equipped with a paid Secretary or chief, and a qualified Consulting Agricultural Chemist at its head, together with agents or representatives at the principal ports of export, and a substantial fund at its disposal for the purpose of safeguarding the interests of producers, and for devising means to extend the uses of this fertilizer, by offering prizes to Agricultural Societies and Farmers' Clubs.

While sulphate of ammonia manufacturers have been reposing and quietly looking on, the producers of nitrate of soda have been on the *qui vive*. Some years ago, they offered prizes of considerable monetary value for the best essays upon the "Uses of Nitrate of Soda in Agriculture." The result was that these offers brought forward some of the leading agricultural chemists of the day, to experiment and work up a case for this material; and they have succeeded in championing its cause with such marked effect as to practically outrival sulphate of ammonia.

How, then, is sulphate of ammonia to be raised to its proper position in relation to nitrate of soda? If the policy adopted by the nitrate of soda producers is any guide in this direction, then let substantial prizes be offered by sulphate of ammonia producers for the best essays upon the uses of sulphate of ammonia in agriculture. At the same time, have the results obtained from carefully conducted field tests tabulated and clearly set forth; and thus enable us to prove to farmers the advantages to be derived from its proper application.

That powerful organization, the Permanent Nitrate Committee, who are constantly devising means to induce the extended use of nitrate of soda in the growth of various crops, are now placing prizes at the disposal of district societies for the best crops grown exclusively or partly by the aid of this fertilizer. In 1895 prizes for turnips, swedes, and mangolds amounted to no less than £60.

If each producer of sulphate of ammonia contributed (say) 6d. per ton on his yield, this, on the total produce of (say) 180,000 tons, would realize £4500 per annum for the objects named aforesaid (1s. per ton would realize £9000 per annum). Assuming that this resulted in placing sulphate of ammonia in its relative position as compared with nitrate of soda—which is probably as much as we may look for—the additional revenue would be something like £300,000 to £400,000 per annum,



Good interest on the outlay! Consumers would be paying no more for their nitrogen; and they would have the satisfaction of knowing that they were supporting a home industry.

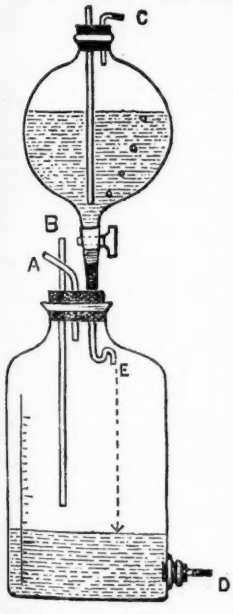
Moreover, the author would suggest that all gas authorities offer prizes to the farmers in their respective districts for the best results obtained from the application of sulphate of ammonia, either alone or as compounded manures made by the farmers themselves, and in which sulphate of ammonia constituted the principal nitrogen ingredient. If it pays nitrate of soda producers and manure manufacturers to do so, surely it applies with equal force to gas authorities. This scheme has been recommended by the author to his Committee; and he is hopeful that it will be acted upon during the forthcoming season, as he feels certain that such a policy will prove to be a step in the right direction. It will popularize sulphate in the district, and lead to increased local demand.

Now that the various county councils are taking up the question of instructing farmers, by field tests, to show them what can be achieved by the proper use of artificial manures (and good seed), there is a wide field open for enterprise on the part of sulphate producers—to either co-operate with the county councils, or independently engage qualified agricultural chemists to lecture up and down the country, and arrange with farmers, who would be willing to place plots of land at disposal, to conduct plot trials for the benefit of the neighbourhood. The Westmorland County Council have instituted these experimental plot trials with commendable success; and the author sent *gratis* a parcel of sulphate to be experimented upon. The result has been highly successful. He is hopeful that when the farmers see for themselves that sulphate of ammonia will, under proper treatment, give profitable returns at a small outlay, and will do what is claimed for it, the home consumption will increase more and more, and this valuable fertilizer will take the position it ought to occupy among agriculturists of the United Kingdom.

A diagram accompanies this paper, giving the relative prices of sulphate of ammonia and nitrate of soda from 1890 to 1895.

A GAS-FLOW TIMING ARRANGEMENT.

The accompanying illustration is taken from a contribution by "H. B." to the "Chemical News." It represents an adaptation of the principle of the clepsydra, or water-clock, of the Ancient Romans, to the purpose of shutting off the supply of gas to a burner or other apparatus at a determined period. It was originally intended for use in connection with steel analysis, to enable samples to be dried automatically. This is a process which takes two or three hours; and the arrangement in question can be adjusted to shut off the gas required for doing the work after heat is no longer needed. The appliance consists essentially of a bottle supplied with water by means of a dropping funnel, with a trapped discharge at E. Gas enters the bottle by the tube A, and leaves it by B, which will slide up and down through the cork of the bottle. The latter is graduated, or the graduation may be on the tube B. The volume of 100 drops from the tube E is measured and marked on the bottle. If now the drops are arranged to fall at so many per minute, the volume falling in any time can be readily calculated, and the sliding tube B adjusted to the height that the water in the bottle will reach at a certain time, when the gas will be shut off.



The stoppers must, of course, be air-tight. Having been once fitted, they need not be removed; C and D being inserted to facilitate the filling and emptying of the vessels. No harm can ensue from the funnel running itself empty, as the trap at E seals the gas in the bottle.

Society of Engineers.—At the ordinary meeting of this Society next Monday, Mr. G. Thudichum, F.C.S., will read a paper on "The Ultimate Purification of Sewage."

The Lighting of the Avenue de l'Opera, Paris.—Electric lighting has been substituted for gas in the above-named important Paris thoroughfare, which, as our readers are aware, has been the scene of several experiments in public illumination. It was here that a trial of electric lighting with Jablochkoff lamps was made about eighteen years ago, shortly after the introduction of that system; and, as may possibly be remembered, it led to the adoption of a competitive scheme of gas lighting in the adjacent Rue du Quatre Septembre—a special lamp, to which the name of the street was given, being designed for the purpose. As far as we remember, gas had the advantage from the point of general illumination; and it was later on restored in the avenue, from which it has once more been banished in favour of its rival. However, the new illuminant will have to compete with the incandescent gas-lights which excite so much admiration in neighbouring parts of the city.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Net Cost of Different Modes of Lighting.

SIR,—The particulars given in your issue of Nov. 17, of trials made by the Electricity Society of Cologne, are very interesting. They give the cost, in decimals of a penny, for one hour of 13·2-candle power obtained from different lamps and burners.

A consideration of these figures shows that they sort themselves into three groups: The first group with an average cost of 0·26d.; the second group, of 0·166d.; and the third group, of 0·083d. The lamps or burners in the first are of comparatively low intensity; the second, somewhat higher; and the third, the highest of all. Stated another way, this means that lights of high intensity and great concentration, though on the whole costing more than the less intense, are much cheaper per candle power. But it does not follow that the usefulness at all corresponds with the cheapness; and for most purposes lights of more costly candle power may be really cheaper, because more available from small centres. Out of these three groups, the electric incandescent light has been excluded, because it does not fall into line with any of the others; being 40 per cent. dearer than the dearest.

The lesson of these figures confirms the conclusions we have arrived at as to the lighting of our works, where during the winter months we have a great deal of night work. If the works were lighted centrally by means of large arc lights, the cost per candle power would be low, and the candle power very high; but the light would not be conveniently available on the men's benches. If, on the other hand, we localized the lighting with incandescent electric lamps, we should be using lights costing 0·5d. per hour for 13·12-candle power; whereas, by using flat-flame gas-burners, we get our light for 0·32d. per hour for 13·2-candle power. That is 40 per cent. cheaper than if we used electricity; and we have, in addition, the heat given off by the gas-burners to help to warm the works.

Commercial Road, S.E., Nov. 25, 1896. RITCHIE & Co.

Carburine as an Enricher.

SIR,—Being anxious to increase the illuminating power of my gas, and have at hand the means of enrichment in case of necessity, I put down a Clark-Maxim machine for 250,000 cubic feet per hour. I was led to believe I should overcome the naphthalene deposit, and increase the illuminating power about one candle for (say) 10,000 cubic feet estimated to be enriched for each 1¼ gallons used, if the gas should fall below 13 candles. To my surprise, I find the carburine ·680 has not only depreciated the gas, but caused, through fractional distillation, a sediment in the syphons, which on examination contains about 40 per cent. of hydrocarbons, of which 19 per cent. is naphthalene. The gas is tested at the Town Hall, about a mile and a half from the gas-works; and though the jet photometer shows 16·2 candles, the gas at the Town Hall is reported to be below 14 candles. The carburine was labelled "·680 spirit." A little experience from others would be of service.

Nov. 26, 1896. ENGINEER.

Laying Gas-Mains in Macadamized Roads.

SIR,—I should be glad of the opinion of some of your numerous readers as to which has been found, from practical experience, to be the better position for the laying of gas-mains in streets made with macadam, which, of course, require consolidating with a heavy road-roller—viz., under the footpath or under the carriage-way. On one or two occasions of late, we have had damage done to the gas-mains, causing rather serious leakages, by the roller passing over for purposes of making certain new streets. The Gas Manager of the Council concerned is strongly in favour of laying the mains under the footpath, to avoid the pressure of the roller; while the Engineer of the Council is equally strongly in favour of laying them under the carriage-way. The District Council are desirous of receiving an opinion from other gas managers or engineers where macadam roads and streets prevail; and they will be much obliged by some reader or readers of the "JOURNAL" expressing an opinion on the matter.

Nov. 27, 1896. CLERK.

Choked Ascension-Pipes.

A "Country Manager" writes: Will some brother gas manager help me to a solution of the choked ascension-pipe difficulty? During the summer and early autumn, my retorts do very well, making 6000 cubic feet per mouthpiece quite easily. After that time, the trouble begins; and now, when I am pushed to the utmost for gas, the choked pipes are doing their very worst to wear out my stokers and drive me to distraction. If anyone can give me a remedy—or even a partial remedy—he will earn my gratitude.

Laying Gas Service-Pipes through Private Land.

A correspondent writes: The "Country Gas Manager's" curious question, in your last issue, may be answered as follows: If the consumer, by the alterations he is going to make, is the cause of the main-pipe being altered, then, I think, he should pay the cost of the new service. But if the gas company, by "laying the new pipe in another direction," reap an advantage, then, I think, the cost of the new service should be a mutual arrangement between the parties.

Gas Supply to Luddenden Foot from Sowerby Bridge.—The Right Hon. J. W. Mellor, Q.C., M.P., has been entrusted with a petition to the Local Government Board, from Luddenden Foot, supporting the proposal of the Sowerby Bridge District Council to extend their gas-mains in that district. When sanction to the project was previously asked, it was declined by the Local Government Board, on the ground that there was no evidence of any desire in Luddenden Foot for the extra facilities.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1897) RELATING TO GAS AND WATER SUPPLY AND ELECTRIC LIGHTING.

Arundel Gas.—Application is to be made to Parliament by the Arundel Gaslight and Coke Company to be dissolved and re-incorporated. The existing share capital is to be converted into one stock with uniform dividend and equal rights; and additional capital will be asked for. A standard price will be proposed, with a sliding-scale. The existing works are to be maintained and enlarged; and authority will be sought to manufacture residual products. The other powers usually granted to suppliers of gas will be included in the Bill.

Ashford Gas.—Application will be made by the Ashford Gas Company, Limited, to be dissolved and re-incorporated, with power to supply gas in Ashford, Willesborough, Kennington, Kingsnorth, Great Chart, and Sevington, or some or one of them, all in the county of Kent. The capital and borrowing powers of the Company are to be defined and regulated; and provision is to be made for the conversion of the original capital into stock, and for the raising of more money. The existing works are to be maintained, and new ones constructed, for the manufacture and storage of gas and residual products. Power will be sought to acquire more land, deal and fit up stoves, levy rates and charges, and supply gas in bulk.

Belfast Water.—The Belfast Water Commissioners purpose applying to Parliament for increased powers. It is proposed to extend the present district of supply so as to make it agree with the Municipal area, and to apply therein the provisions of the Acts under which the Commissioners now exercise authority. The rights and liabilities of the Belfast Guardians in regard to the supply of water in certain districts are to be transferred to the Commissioners, who will then be able to levy rates therein. New works are to be constructed, including a storage reservoir in the valley of the Annalong River, two high-service tanks, and a high-service reservoir, together with two pipe-lines and pumping-stations. Additional lands and more money will be required.

Bolton Improvement.—In a Tramways and Improvement Bill to be promoted by the Bolton Corporation, power will be sought to use additional lands for the erection of works for the manufacture of gas and residuals, and to establish a thrift fund for their officers and servants. Provision is to be made for the compulsory redemption of gas annuities.

Caerphilly Water and Gas.—The Urban District Council of Caerphilly intend to apply for power to construct new water-works for the better supply of their district. They will comprise a weir to be formed on the Nant-cwm-Sarn Brook, three reservoirs, a water-tank, two catchwaters, several lines of pipes, and a road diversion. Application will be made for authority to take lands, easements, springs, streams, and water-rights compulsorily, and to break up roads, &c.; also to purchase, by compulsion or agreement, the works of the Caerphilly and Taff's Well Gas and Water Companies, and the sites thereof, and to supply their district. It is proposed to alter the Rhymney Valley Gas and Water Company's Act of 1892, and to transfer to the Council the works within the district of the latter body. All the necessary power to enable the Council to furnish a supply of water and gas, and deal in meters, fittings, and other appliances used in connection therewith, will be applied for, as well as permission to raise more money.

Carnarvon Corporation.—In a General Bill to be promoted by the Carnarvon Corporation, they will apply for power to amend the provisions of the Acts relating to their water undertaking in so far as regards the payment of water-rents by owners instead of occupiers in certain cases, and also with respect to the charges for the supply of water by meter. Other provisions, not specified in the notice, are to be made.

Chichester Corporation Water.—The Corporation of Chichester intend to apply for authority to purchase the undertaking of the Chichester Water-Works Company, and to confirm an agreement already entered into with this object. The Company will be dissolved; and all their rights and privileges will be transferred to the Corporation. It is proposed to extend the limits of supply. Power will be sought to raise the necessary money, purchase land by agreement, supply water in bulk, and levy rates and charges.

Clydebank and District Water.—Application is to be made to Parliament for authority to abolish or alter the existing local or water authority within the Duntocher and Dalmuir special district, and to incorporate in their stead a Public Trust. A new water supply is to be provided; and power will be sought to acquire lands, make works, divert and take water, and generally carry on the undertaking. All the rights and liabilities of the existing authority are to be transferred to the Trust. Further borrowing powers will be applied for.

Colne Corporation.—The Corporation of Colne intend to apply for power to construct new water-works, comprising a reservoir in the township of Trawden, two aqueducts or pipe-lines, and certain road diversions. Provision is to be made for furnishing compensation water, for temporary supplies, the sale of fittings, and the execution of plumbing work. Further borrowing powers will be sought.

Cowes Gas.—The Urban District Council of Cowes intend to apply for power to purchase, by compulsion or agreement, the undertaking of the Cowes Gas Company, maintain, continue, and enlarge the existing gas-works, and supply gas within the parishes of Cowes and Northwood, in the Isle of Wight. In the Bill to be promoted, provision will be made for the dissolution of the Company, the acquisition of additional lands, and the supply of gas-fittings, &c. Authority will be sought to levy rates and charges, sell gas in bulk, and raise money. The Act obtained by the Company last session is to be altered and amended so as to be applicable to the Council; and arrangements will be made for the payment of the costs incurred by that body in opposing the measure.

Craigcrook Mortification.—The Trustees of the Craigcrook Mortification (a body constituted under a deed executed by John Strachan, of Craigcrook, Mid Lothian, and dated Sept. 24, 1712) desire to be incorporated with increased powers, including authority to provide, or contract to provide, a supply of water, gas, and electric light. Provision will be made for the raising of money, on the security of the property transferred to the new body, for carrying out the objects of the Bill to be applied for.

Crays Gas.—Application will be made by the Crays Gas Company for power to purchase additional lands by agreement, and raise more money. It is proposed to convert or consolidate the existing capital, with a lower standard rate of dividend, with the sliding-scale, and the consequent increase of the nominal amount; and a reserve fund is to be created. Further provisions will be sought in regard to the supply of gas, meters, and fittings; and the period of any erroneous meter registration is to be limited to the quarter in which it occurs, unless the contrary shall be proved to the satisfaction of the meter inspector.

Crowborough District Water.—It is proposed to apply to Parliament for powers of incorporation for a Company formed to construct works for the supply of water in the parishes of Rotherfield, Withyham, and Buxted, in Sussex. The works will comprise two impounding and two service reservoirs, a water-tower, and four conduits or pipe-lines. All the rights and privileges usually granted to suppliers of water will be asked for.

Deal and Walmer Water.—Authority will be sought by the Corporation of Deal and the Urban District Council of Walmer to acquire, by agreement or compulsion, the works and property of the Deal Water Company. A Joint Water Board or Joint Committee is to be formed, in whom the undertaking is to be invested. The Company will, of course, be dissolved; and the Board or Committee will succeed to all their rights, powers, and privileges. It is proposed to extend the limits of supply; and the entire area will be divided into separate districts. The usual powers in regard to water will be applied for, as well as authority to borrow the necessary money.

Devonport Water.—The Devonport Water Company intend to apply for the repeal or amendment of section 14 of their Act of 1893, which contains provisions with reference to the supply of water in bulk to the Urban District Council of East Stonehouse. An extension of time is to be asked for the completion of certain works authorized by their Act of 1889, as well as for authority to enter into agreements with the Lords of the Admiralty for the supply of water in bulk or otherwise.

Dublin Corporation.—The Dublin Corporation intend to renew the application of last session in regard to the supply of water by them to the Commissioners of the several townships of Bray, Blackrock, Clontarf, Dalkey, Drumcondra, Killiney and Ballybrack, Kilmainham, Kingstown, and Pembroke. Provision will be made for the payment for such supply, and for any water consumed in excess of the statutable quantity. The Commissioners of any of the townships are to be enabled to apply to the Corporation to be supplied with water at a uniform rate or price; and in case of such application, the Corporation are to be bound to supply on terms to be prescribed.

Dumfries and Maxwelltown Water.—The Water Commissioners of Dumfries and Maxwelltown intend to apply to be incorporated with extended powers and limits of supply. Authority will be sought to enable them to maintain and enlarge their works, supply water within and beyond the limits by rate or meter (subject to regulations for preventing waste and misuse), and to levy domestic and public water-rates.

Dundee Improvement.—The Dundee Gas Commissioners intend to apply for power to raise additional money for the general purposes of their gas and electric light undertakings, by the creation and issue of debenture stock; and to make new or altered provisions with respect to the borrowing of money and the repayment of existing loans, as well as in regard to the sinking fund. It is proposed to extend the area of supply of electricity and electric light for public and private purposes, and to apply to the added district the provisions of the Commissioners' Order of 1890; but they wish to be exempt from the obligation to supply energy in such parts thereof, and under such conditions or circumstances, as shall be specified in the Bill. Authority to acquire additional lands and property will be sought.

Eastbourne Corporation Water.—The Corporation of Eastbourne purpose applying for power to purchase, by compulsion or agreement, the undertaking of the Eastbourne Water Company, and maintain and improve the existing works. In the event of the purchase being sanctioned, the Company will be dissolved and wound up. Provision is to be made for the compulsory acquisition of lands and easements, including the Holywell Springs. Authority to borrow the necessary money will be asked for, as well as general powers in regard to water supply.

Eastbourne Water.—The Eastbourne Water Company intend to apply for authority to construct additional works, consisting of a well or shaft in the Filching Glen, in the parishes of Folkington and Jevington, or one of them, several adits, a pumping-station in the parish of Litlington, and various subsidiary works. Power will be sought to purchase lands, waters, and easements compulsorily, and to apply the Company's existing funds, and other moneys they may be authorized to raise, to the foregoing and the general purposes of the undertaking.

East London Water.—Authority will be sought by the East London Water Company to construct two new storage reservoirs, aqueducts, conduits, and pipe-lines, and other works, in the counties of Middlesex and Essex. One reservoir will be situated partly in Tottenham and Edmonton and partly in Walthamstow and Chingford; and the other, in close proximity thereto. There will be four aqueducts and two conduits or pipe-lines in connection with the reservoirs. Permission will be sought to appropriate the waters of the River Lea, the Tottenham Mill Lead, the Ching Brook, and the Chingford Mill Stream, and to purchase lands by compulsion or agreement. Certain portions of the Water-Works Clauses Acts, 1847 and 1863 (except section 12 of the latter Act), are to be extended to the Company. Further borrowing powers will be applied for, as well as authority to enter into agreement with one or more of the Metropolitan Water Companies for the use of their works, mains, and pipes, and for obtaining a supply of water.

East Warwickshire Water.—The East Warwickshire Water-Works Company will seek permission to construct additional works, consisting of a well and pumping-station in the parish of Polesworth, an impounding reservoir, three filter-beds, and a water-tank in the parish of Astley, a reservoir in the parish of Chilvers Coton, and various conduits or pipe-lines. Authority will be sought to purchase lands compulsorily. The Company's limits of supply are to include Bedworth; and power will be applied for to alter the existing rates and charges. Further share and loan capital will be needed.

Edinburgh Corporation.—In a Bill to be promoted for a variety of purposes, the Edinburgh Corporation will apply for power to hand over to the Gas Commissioners the undertaking of the Portobello Gaslight Company, Limited, transferred to them under the Edinburgh Extension Act of last session; to extend the limits for the supply of gas; and, if necessary, to amend the terms and conditions of the agreement in respect of these works contained in a schedule to the above-named Act, and the Act itself so far as it relates to the annuities to be paid to the shareholders, and to the debts and liabilities of the Company transferred.

Fylde Water-Works Transfer.—Application will be made for authority to form a Joint Water Board, consisting of representatives of the Town Council of Blackpool and the Urban District Councils of Fleetwood, Lytham, St. Anne's-on-the-Sea, and Kirkham, and the Rural District Councils of the Fylde and Garstang Unions, for the acquisition of the undertaking of the Fylde Water-Works Company. In the event of this being sanctioned, the Company will be dissolved. Provisions are to be made for the maintenance and enlargement of the existing works, and the supply of water, by measure or otherwise, within limits to be defined in the Bill. It is proposed to give power to the Corporation of Manchester to supply, and to the Joint Board to take, water from the works of the Corporation; and certain provisions of the Manchester Corporation Water-Works Act, 1879, will then apply to the Board. The manner in which the contributions of the constituent authorities are to be raised, and any disputes settled, will be specified. Power to borrow the money necessary for carrying out these objects will be applied for.

Gravesend and Milton Water.—The Gravesend and Milton Water Company intend to apply for power to raise additional capital, by shares or debentures, for the general purposes of their undertaking, and for the capitalization or recoupment of money expended out of revenue for capital purposes. The Company's Act of 1846, and any others relating to the undertaking, are to be amended.

Gravesend and Northfleet Water Board.—Application will be made for power to constitute and incorporate a water authority for the borough of Gravesend and the urban district of Northfleet, in Kent, to whom is to be transferred the undertaking of the Gravesend and Milton Water Company, which will be dissolved and wound up. In the Bill to be promoted, provision will be made for maintaining, enlarging, and improving the existing works, and generally carrying on the business of water supply in the present and extended limits. Borrowing powers will, of course, be applied for.

Gravesend Corporation Water.—The Gravesend Corporation will apply for power to acquire the whole or part of the undertaking of the Gravesend and Milton Water Company, to carry on and enlarge the works, and supply water throughout the borough, as well as within the urban district of Northfleet, and the parishes of Denton, Chalk, Ifield, and Southfleet, all in Kent. The powers usually conferred upon water companies will be applied for, and also authority to raise the necessary money.

Harrogate Corporation (Water-Works Transfer).—The Corporation of Harrogate are desirous of purchasing, by compulsion or agreement, the undertaking of the Harrogate Water Company; and they will apply for the necessary authority to do so. In the event of this being granted, the Company will be dissolved and wound up. Provision will be made for maintaining the existing works, regulating the supply of water, and levying rates and charges. The usual power to borrow money for the above purpose will be sought.

Harrogate Water.—The Harrogate Water Company will seek authority to construct and maintain additional works, consisting of a reservoir on the Scargill Beck and various conduits or pipe-lines. Power will be asked to take lands and waters, levy rates and charges, and make agreements with local authorities and others. Additional capital will be needed.

Huddersfield Corporation.—In a General Bill to be applied for by the Huddersfield Corporation, authority will be sought to run carriages on their tramways, and work them by steam, electric, or any mechanical power; also to acquire additional land, and manufacture and store gas and residual products thereon. Provision will be made for notice to be given to the Corporation before any pipes or fittings used for the conveyance or consumption of gas are covered over; and the Corporation are to compel the removal of such as, from their natural construction or workmanship, would be likely to allow of an escape of gas. They are also to be empowered to prescribe the material, size, and strength of any pipes and fittings so to be used. It is proposed to alter the position in the gas-works of the testing-place prescribed in section 28 of the Huddersfield Corporation Water-Works and Improvement Act, 1876. Further borrowing powers will be included in the Bill.

Hunstanton Water and Gas.—Application will be made for the dissolution and re-incorporation of the Hunstanton Water Company, Limited, with powers of supply in the parishes of Hunstanton, Barrett Ringstead, and Heacham. The present works are to be continued, and new ones constructed. The Hunstanton Gas Company is to be dissolved, and their undertaking transferred to the new Company, who will ask for authority to supply gas in the above-named parishes, and to have conferred upon them the usual powers granted to gas companies. There will be a revision of the capital and financial arrangements.

Kent Water Board.—It is proposed to constitute a Water Board for the Urban Districts of Beckenham, Bromley, Dartford, Erith, and Bexley, and the Rural Districts of Bromley, Dartford, and Sevenoaks, all in Kent, with authority to purchase the undertaking of the Kent Water Company, and so much of the Lambeth Water Company's as is situated in Kent, and vest it in the Board. In this event, the former Company will be dissolved. Power will be sought to maintain and improve existing works, and re-transfer portions of them within the County of London to the London County Council, or to "any company or authority that has been or may be established by Parliament for the supply of water within the County of London." The usual rights and privileges accorded to suppliers of water will be asked for.

Kingston-upon-Hull Corporation.—The Corporation of Kingston-upon-Hull intend to promote a General Bill for the extension and improvement of the borough. Included therein will be provisions in regard to the charge for water, the application of the water profits and the reserve fund to general municipal purposes, and the certification of water-meters. Authority will be asked to enable the Corporation, the Kingston-upon-Hull Gas Company, the British Gaslight Company, Limited, and the Sutton, Southcoates, and Drypool Gas Company, or any one or more of them, to enter into agreements for the purchase of the undertaking of the Kingston Company, the transfer of the area of supply to either or both of the other Companies, or to purchase the gas required for the supply of the district of the Kingston Company from either of the other Companies, and to dissolve that Company; also to enable the Corporation to borrow money for the purpose of the purchase, confirm any agreement or agreements that may be entered into before the passing of the intended Bill, and make all necessary provisions for carrying the purchase, transfer, and agreements into effect. The Corporation's Extension Act of 1882 is to be repealed so far as sections 11 and 66 are concerned; and provision is to be made that all or any of the Acts or Orders relating to the supply of water to the borough shall apply to the district lately supplied by the Newington Water Company, and now served by the Corporation; and to repeal such other Acts or Orders, and to consolidate their provisions, or make others, so as to render uniform all enactments relating to water supply within the borough.

Leeds Corporation.—The Corporation of Leeds, in a General Bill of which they have given notice, will seek authority to purchase, compulsorily or by agreement, certain lands in the Washburn Valley for the protection of their waters and water-works from pollution, and to make bye-laws and regulations in regard thereto; also to lay down pipes, and construct drains, sewers, and watercourses in connection with the scheme. Authority will be sought to borrow more money.

Leicester Corporation.—The Corporation of Leicester intend to apply for authority to extend their limits of gas and water supply—in the case of the former, so as to include Glenfield, Groby, Anstey, Ratby, Lubbesthorpe, Leicester Forest East, Kirby Muxloe, Kirby Frith, Newtown Linford, Cropston, Thurcaston, Scraptoft, Thurnby, Bushey, and Stoughton, or some of them; in that of the latter, so as to comprise Sileby, Syston, Mount Sorrel, Rothley, Wanlip, Swithland, Cossington, and Thurmaston North, or any of them. Further borrowing powers will be sought.

Llandudno Urban District Council.—A General Bill of which notice has been given by the above-named Council will contain a clause authorizing them to make regulations for, or with respect to, the size and material to be used for service and other pipes and fittings for the supply and consumption of gas in all new buildings to be supplied with gas by the Council; and to enable them to lay and fix, at the expense of the owners of the house or premises to be supplied thereby, the portion of the service-pipe which may be deemed necessary to make the connection between the stopcock provided by the Council and the meter or meters belonging to, or used by, the gas consumer.

London Water Companies' Purchase Bills.—The London County Council have notified their intention to promote eight Bills for the purchase of the undertakings of the Metropolitan Water Companies. A full abstract of the notice referring to the Chelsea Company appeared in the "JOURNAL" last week (p. 1027); and the only variation between this and the others—viz., in regard to the disposal of parts of the undertakings to outside authorities—was indicated. The notice given by the Council of another Bill, to sanction the creation and issue of consolidated stock or annuities to enable them to effect the purchase, was also dealt with last week.

Loughborough Corporation.—Application will be made by the Loughborough Corporation for power to construct some additional works, consisting of a reservoir in the parishes of Whitwick, Shepshed, and Charley, or one or more of them, and a conduit or pipe-line therefrom to the main leading from the existing reservoir No. 1 to the Nanpantan reservoir. Certain existing works are to be abandoned and levels altered. Power to employ the present funds for the above-named purpose and to raise more money will be included in the Bill to be promoted.

Lowestoft Corporation (Water and Gas).—The Corporation of Lowestoft intend to apply for power to purchase, by compulsion or agreement, the undertaking of the Lowestoft Water, Gas, and Market Company, and supply water, gas, meters, and fittings. It is proposed to maintain and improve all or some of the existing water or gas works. Authority to raise the necessary money will be sought.

Lowestoft Water, Gas, and Market.—It is the intention of the Lowestoft Water, Gas, and Market Company to apply for power to construct new works and acquire lands for this and other purposes connected with their water undertaking. The additional works include two filter-tunnels, a pumping-station, a tank, and five lines of pipes. The capital is to be consolidated, and more will be required. It is proposed to change the name to the Lowestoft Water and Gas Company.

Luton Water.—The Luton Water Company wish to purchase by agreement certain lands for the purposes of their undertaking; and they will apply for the necessary authority, and also for power to raise more money. The existing capital is to be consolidated; and certain sections of the Company's Act of 1865 are to be amended.

Maidstone Corporation (Water-Works Transfer).—Application will be made by the Maidstone Corporation for power to purchase, by compulsion or agreement, the undertaking of the Maidstone Water-Works Company, and to maintain and improve the existing works.

It is proposed to extend the limits of supply so as to include Maidstone, Barming, East Farleigh, Loose, Boxley, and Aylesford, and to make better provisions generally for the supply of water. Power will be sought to purchase lands and property; to borrow money on the security of the water undertaking; and to form a reserve fund.

Malvern Link Gas.—Application will be made for authority to dissolve and re-incorporate the Malvern Link Gas Company, Limited, with a changed name. Power will be sought to supply gas in the parishes of Leigh, Mathon, Bransford, Powick, Newland, Madresfield, Colwall, and Cradley, in the counties of Worcester and Hereford; to acquire additional lands by agreement; manufacture gas and residual products, meters, fittings, &c.; and to sell gas in bulk by agreement outside the limits of supply. Provision will be made for the acquisition of the Company's undertaking by the Malvern Link District Council; and also for the raising of further capital.

Malvern Link Urban District Gas.—Power will be sought by the Malvern Link Urban District Council to acquire the undertaking of the Malvern Link Gas Company, Limited, maintain and renew their works, and manufacture and supply gas in the district of the Council, as well as in the parishes of Leigh, Mathon, Newland, Madresfield, Bransford, and Powick, in Worcestershire, and Colwall and Cradley, in Herefordshire. The usual authority to supply fittings and appliances, levy rates and charges, and sell gas in bulk, will be sought; also permission to borrow money.

Malvern Urban District Gas.—The Malvern Urban District Council are desirous of purchasing, by compulsion or agreement, the undertaking of the Malvern Link Gas Company, carrying on, extending, and enlarging the works, and supplying gas in Great Malvern and several adjacent parishes and places in Worcestershire, as well as in Cradley and Colwall, in Herefordshire. The usual powers as to gas supply will be sought, and also authority to raise more money.

Manchester Corporation.—In a General Bill to be promoted by the Manchester Corporation, application will be made for power to construct a new water-main from one of the Audenshaw reservoirs to the Godley reservoir, situated in the parish of Mottram-en-Longdendale, in Cheshire; and also an effluent conduit commencing at Davyhulme, and terminating in Thelwall. From the latter is to be discharged the effluent from the sewage works of the Corporation at Davyhulme into the River Mersey. Authority will likewise be sought to enter into agreements with outside local bodies for the supply of electricity, and to make regulations for controlling installations of the electric light.

Newark Corporation Water.—The Newark Corporation desire to extend their limits of water supply so as to include a number of adjacent parishes, townships, and extra-parochial places, and to lay the necessary lines of mains to connect them with the existing works. Authority to break up roads, supply water in bulk, and levy rates and charges, as well as to raise more money, will be sought.

Newhaven and Seaford Water.—Application is to be made for the dissolution and re-incorporation of the Newhaven and Seaford Water Company, Limited, with all the powers and liabilities belonging thereto. New works are to be constructed in the parishes of Bishopstone, Denton, and Newhaven. They are to consist of a well, pumping-station, water-tower, storage reservoir, and three pipe-lines. Provision will be made for the acquisition of lands and waters; and also for the supply of water in bulk. The limits of supply are to be extended so as to include South Heighton, Tarring Neville, Piddinghoe, Beddingham, West Firle, Alciston, and Alfriston, all in Sussex. Authority will be sought to create and issue more capital, and to levy rates and charges; also to manufacture and sell meters, fittings, and apparatus, or let meters on hire.

New Hunstanton Water and Gas.—The Urban District Council of New Hunstanton require power to supply water and gas, and for this purpose to purchase the undertakings of the Hunstanton Water and Gas Companies. Authority will be sought to maintain and renew the existing works, manufacture gas and residuals, and supply gas and water within the Council's district and the parishes of Hunstanton, Barrett Ringstead, and Heacham, in Norfolk. The necessary borrowing powers will be applied for.

Newport Corporation.—The Corporation of Newport (Mon.) are desirous of reviving certain powers already conferred upon them in respect of water-works, and of obtaining authority for the construction of other works. In lieu of the Newchurch and Wentwood reservoirs, and three aqueducts in connection therewith sanctioned by the Act of 1887, it is proposed to make an intake reservoir at Newchurch, on the Castroggy Brook, and construct other aqueducts or lines of pipe. The powers sought to be revived relate to the Llanoaches reservoir, which the Corporation now wish to make, together with a conduit or pipe-line to run from it to a point in the main road from Newport to Chepstow, about eight miles from the former town. Authority will be sought to divert and alter the levels of public roads, take certain common or commonable lands, and carry out the necessary incidental works.

New River Company.—Application is to be made by the New River Company for authority to construct new aqueducts or pipe-lines from the Staines reservoirs aqueduct, in the parishes of Hanworth and Sunbury, to new subsiding reservoirs, filter-beds, and pumping-station in the same parishes, and from the new pumping-station to an equalizing reservoir and pumping-station in Willesden, and thence to a new service reservoir and pumping-station in Finchley or Hornsey, with subsidiary lines of pipes in the parishes of Heston, Norwood, Greenford (or Great Greenford), Wembley, Twyford (or Twyford Abbey), Willesden, Hendon, Finchley, and Hornsey. Provision will be made for the discharge of water from any of the aqueducts or pipe-lines above referred to into contiguous rivers, streams, brooks, or watercourses. More money will be required. The Company will ask for the repeal or variation, so far as may be necessary or thought expedient for the objects of the proposed Bill, of certain of the provisions of the Staines Reservoirs, &c., Act, 1896, and especially (but not exclusively) of section 69; and they will apply to be enabled, in conjunction with the Staines Reservoirs Joint Committee, to enter into and carry into effect agreements and arrangements with reference to the taking of water by the Company, by means of the intended works to be authorized by the Bill, or any of them, from the reservoirs of the Committee, and also to have any agreements or arrangements which have been or may be entered into sanctioned or confirmed. All rights and privileges inconsistent with any of the objects of the Bill are to be varied and extinguished, and others conferred.

Nottingham Corporation Water.—The Corporation of Nottingham intend to seek authority to construct additional water-works, comprising a well and pumping-station in Oxton, another in Woodborough, and a third in Boughton, a covered service reservoir in Arnold, and various aqueducts or pipe-lines. Power to purchase lands and easements compulsorily will be sought, as well as to take underground waters and streams. It is proposed to extend the present limits of supply so as to include Calverton, Woodborough, Lambley, Oxton, and Epperstone, all in the county of Nottingham; and the Corporation are to exercise their existing powers in these places. Provision is to be made for the supply of water in bulk or otherwise to any public body or private person within five miles of any of the aqueducts to be authorized, or such other limits as may be prescribed. Additional borrowing powers will be needed.

Perth Harbour, City Improvements, and Gas.—In a General Bill to be promoted by the Corporation of Perth, authority will be sought to enable the Gas Commissioners to purchase land for the erection of new works for the manufacture, storage, and supply of gas and residual products, meters, fittings, &c. The usual powers will be applied for to enable the Commissioners to interfere with streets and roads, so as to lay mains and pipes, and also to supply gas in bulk. Provisions will be included for the protection of the works, and the prevention of waste, misuse, or fraudulent use of gas. The existing Gas Acts are to be varied with respect to estimates, as well as to rates, rents, and charges, which may be either uniform or differential. The illuminating power of the gas is to be reduced, and further provisions are to be made with respect to its quality and the testing thereof. Miscellaneous provisions relate to the application of the funds of the Gas Commissioners; the contribution by them towards the cost of a bridge and the construction of a road, if used for gas-mains; the employment of the surplus funds of the gas undertaking for defraying the cost of improving the streets and erecting buildings, &c.; and the raising of more money.

Pontypridd Water-Works.—The Pontypridd Water Company propose to introduce a Bill to extend the period limited by their Act of 1892 for the compulsory purchase and taking of lands and other property for the purposes of the additional reservoirs and works authorized by that Act, and also to extend the time limited by that Act, and by one of 1894, for the construction of those works.

Pwllheli Corporation.—The Pwllheli Corporation are desirous of purchasing the undertaking of the Pwllheli Water Company; and in a General Bill, they will apply for the necessary authority, as well as for power to maintain the present and construct additional works, consisting of a high-service reservoir at Drefain and two pipe-lines, and take lands and waters. More money will be applied for.

Reigate Corporation.—The Corporation of Reigate notify their intention of applying for an Act to reduce the rates and charges which the East Surrey Water Company may make for the supply of water within the borough, and prescribe an amended scale; also to require the Company to sell by measure. It is proposed to apply for the repeal and amendment of the provisions of the Company's Acts relating to the charges for water for baths, &c., and for trade purposes, as well as of a proviso in section 52 of their Act of 1885, which enables them to refuse to supply water to the occupier of any part of a dwelling-house unless the rate is paid for the whole house. Provision is to be made that any person within the borough who has been supplied from the Reigate Water-Works prior to Sept. 30, 1896, shall be entitled to a continuance of such supply.

Rhymney and Aber Valleys Gas and Water.—Application will be made for the incorporation of a Company to construct works and supply water in certain parishes and portions of parishes in the counties of Glamorgan, Monmouth, and Brecon, and to acquire the undertakings of the Rhymney Valley Gas and Water Company, the New Tredegar Gas and Water Company, Limited, the Rhymney Gas Company, Limited, the Caerphilly Gaslight, Coke, and Water Company, Limited, and the water-works of the Rhymney Iron Company, Limited. Authority will be sought to make agreements with the owners of these undertakings, as well as with local authorities and others; to purchase lands compulsorily; and to levy rents, rates, and charges. The works proposed to be constructed comprise a reservoir, three filter-beds and a service-tank, a pipe-line, and a carriage road. The limits within which gas and water are to be supplied will be defined in the Bill to be promoted.

St. Anne's-on-the-Sea Gas.—Power will be sought by the Urban District Council of St. Anne's-on-the-Sea to acquire the undertaking of the St. Anne's Gas Company and carry it on. Any agreement entered into between the Council and the Company with reference to such purchase before the passing of the Bill to be applied for is to be confirmed; and in the event of the consideration-money being determined by arbitration, the arbitrators are to have regard to such special instructions in respect of the mortgage, loan, and contingent rent-charge created by the Company as may be prescribed by the Bill and sanctioned by Parliament. Authority will be asked to maintain the existing works, acquire additional lands, and borrow money.

St. Neots Water.—Powers of incorporation will be sought by a Company formed for the construction of works and the supply of water within the parishes and districts of St. Neots and Eynesbury, in Huntingdonshire, and Eaton Socon, in Bedfordshire. The works will consist of wells and a pumping-station, adjoining the River Ouse, at Eynesbury, a second pumping-station, and two connecting pipe-lines. The usual rights and privileges accorded to suppliers of water will be applied for.

Southampton Corporation Water.—The Corporation of Southampton are desirous of acquiring the undertaking of the South Hants Water-Works Company, either compulsorily or by agreement; and they will apply for the necessary powers of purchase. In the event of these being granted, the Company will be wound up. Certain new works are to be constructed, comprising a service-tank in the parish of St. Faith, Southampton, and a line of pipes in the parish of Otterbourne, commencing at the existing pumping-station of the

Corporation, and terminating at the above-mentioned service-tank. In the Bill to be promoted, provisions will be included for the acquisition of lands and easements compulsorily or by agreement, the alteration of the rates and charges, the sale of water in bulk, the checking of waste, and other matters. Authority to raise more money will be applied for.

South Metropolitan Gas.—The South Metropolitan Gas Company intend to apply for power to amend their Act of last session, so as to alter the qualification for a seat on the Board of the Company. The text of the notice of the proposed application to Parliament for the purpose specified was given in the "JOURNAL" last week.

Stirling Burgh (Gas).—Power will be sought by the Stirling Commissioners to purchase by agreement the undertaking of the Stirling Gaslight Company, maintain and extend their works, and construct additional works for the manufacture, storage, and supply of gas and other products. The limits are to be defined and extended. The Commissioners will ask for authority to enter into agreements for the supply of gas within the enlarged district, levy rates and charges, and raise more money.

Swadlincote Gas.—Power will be sought by the Urban District Council of Swadlincote to supply gas, and for this purpose to acquire the undertaking of the Swadlincote Gas Company, with all the rights and privileges appertaining thereto. Permission to raise the necessary money will be applied for.

Swansea Electric Lighting.—The Swansea Improvements and Tramways Company intend to apply for authority to purchase lands and construct works for generating and supplying electricity or other motive force, and to make agreements with the Corporation of Swansea with regard to the exercise by the Company of the Corporation's electric lighting powers.

Taunton Gas.—The Taunton Gas Company intend to apply for authority to raise additional capital, as well as for further powers with respect to the supply of gas, fittings, and other appliances, the laying of mains, and other matters. In the Bill to be promoted, provisions will be included in regard to rents, rates, and charges, the number of Directors and Auditors, the dates of the general meetings, and the illuminating power and testing of the gas.

Torquay Corporation Water.—The Corporation of Torquay wish to amend, repeal, and consolidate certain Acts and Orders relating to them and to their water-works, and to have power to protect the source of the water and prevent its pollution; also generally as to supply. Authority to raise more money will be applied for.

Tuxford and District Gas.—Application will be made for the incorporation of a company to construct works and manufacture and supply gas in the parishes of Tuxford, East Markham, Markham Clinton, Egmanton, and Weston, in the county of Nottingham, and to purchase the undertaking of the Tuxford Gas Company, Limited. The usual powers conferred upon suppliers of gas will be asked for, as well as authority to apply for a Licence or Provisional Order under the Electric Lighting Acts, and to use their funds for the purpose.

Tynemouth Corporation Water.—Power will be sought by the Corporation of Tynemouth to supply water in that borough and in the neighbouring townships. They desire to acquire compulsorily or by agreement the undertaking of the North Shields Water-Works Company, freed from the share or interest therein of the Lord of the Manor of Tynemouth, to whom certain rights of the Company are to be surrendered. It is proposed to enter into agreements with the Newcastle and Gateshead Water Company for the transference to the Corporation of the rights and liabilities of the North Shields Company in respect to them or to any other body or person. The Corporation wish for authority to maintain, sell, or discontinue the existing works, and make others, and generally to carry on the business of water supply. Further borrowing powers will be applied for.

Tynemouth Gas.—The Tynemouth Gas Company intend to apply for additional capital and borrowing powers; the existing capital to be converted or consolidated. The scale of voting at general meetings is to be altered, and the qualification for a Director increased. Further provisions are to be made in regard to the supply of gas and meters; and discounts are to be allowed.

Weymouth Gas.—Application will be made by the Weymouth Consumers' Gas Company for authority to extend their limits of supply, so as to include Upway, Broadway, Preston, and Chickerell, in Dorset; and to convert, consolidate, and increase the nominal amount of their present capital, and raise more money. In the Bill to be promoted for the above-named objects, the Company will ask for power to purchase lands, manufacture and deal in stoves and other appliances, and produce and supply electricity.

Weymouth Water.—The Weymouth Water Company desire to extend their limits of supply, so as to include Bincombe, Broadway, Upway, Chickerell, and part of Radipole. It is proposed to construct additional works, comprising a service-tank in the parish of Wyke Regis, three lines of pipes, and some subsidiary works. Certain lands and waters are to be acquired; and provision is to be made for the supply of water to the Admiralty and other Government Departments at Portland. More capital will be needed.

NOTICES OF APPLICATIONS TO THE BOARD OF TRADE FOR PROVISIONAL ORDERS (SESSION 1897).

Under the Gas and Water Works Facilities Act, 1870.

Barton-upon-Humber Water.—The Barton-upon-Humber Water Company, Limited, will apply for an Order to confirm the transfer to them of the undertaking of the Barton-upon-Humber and District Water Company, Limited, established under Provisional Order in 1885, together with all the rights and privileges conferred thereby. The capital and borrowing powers are to be fixed and defined; and authority will be sought to alter them.

Benfleet District Water.—Application is to be made for power to construct works and supply water in the parishes of South Benfleet, Hadleigh, Rayleigh, Hockley, Bowers Gifford, Canvey, Pitsea, and Vange, in Essex. The usual authority will be sought to acquire lands, break up roads, lay down mains and pipes, and levy rates and charges.

Frith Hill, Godalming, and Farncombe Water.—The Frith Hill, Godalming, and Farncombe Water Company, Limited, intend to apply for authority to construct additional works, comprising a pumping-station, well, and reservoir in Godalming, and three pipe-lines in connection therewith. Further capital will be needed, and power will be sought to raise it; also to break up streets, levy rates and charges, &c. The Company's Orders of 1878, 1886, and 1890 are to be amended.

Gosport Water.—The Gosport Water Company intend to apply for power to construct additional works in the county of Southampton, and to extend their limits of supply so as to include the parish of Rowner. Further capital will be needed.

Harrogate Gas.—The Harrogate Gas Company will apply for power to construct and maintain additional works, and maintain and continue gasholders, on certain lands in the parishes of Killinghall and Bilton; also to purchase other lands by agreement. Permission will be sought to raise further capital by new shares or stock.

Killamarsh Gas.—Application will be made by the Killamarsh Gaslight and Coke Company, Limited, for power to construct and maintain gas-works, and to supply gas in the parish of Killamarsh, in the county of Derby. Authority will be sought to levy rates and charges, break up roads, and supply gas in bulk, as well as meters, fittings, &c. The Company's present capital is to be defined and fixed; and they will ask permission to raise more.

Market Harborough Gas.—The Market Harborough Gas Company, Limited, intend to apply for power to maintain and continue their gas-works, and manufacture and supply gas within the urban district of Market Harborough and Great and Little Bowden, as well as in part of the parish of Lubenham, in Leicestershire. They will also ask for authority to supply gas-meters and other appliances, open roads, make agreements with local authorities, levy rates and charges, and raise additional capital.

Newmarket Water.—Application will be made by or on behalf of the Newmarket Water-Works Company, Limited, for power to raise additional capital by the creation of shares or stock, or by the issue of debentures.

Royston Water.—Application is to be made by the Royston Water-Works Company, Limited, for power to maintain and continue water-works, and supply water in certain parishes in the counties of Hertford and Cambridge. The usual rights and privileges will be sought, as well as authority to raise more money. The capital is to be defined and the dividends regulated.

Sedbergh Gas.—The Sedbergh New Gas Company, Limited, will apply for power to maintain and continue their existing gas-works, produce any other means of light, and supply the same, as well as meters, fittings, &c., in the parish of Sedbergh, in the county of York. The limits of supply are to be defined; and the usual authority will be sought to break up roads, lay mains and pipes, sell gas in bulk, levy rates and charges, &c.

South Hayling Water.—The South Hayling Water Company, Limited, wish for authority to abandon the works sanctioned by the South Hayling Water Order, 1895, and to construct others in the parish of North Hayling. They will consist of two pumping-stations and all the service or storage reservoirs, filter-beds, conduits, mains, and pipes necessary for the conveyance and distribution of water. It is proposed to extend the limits of supply so as to include North Hayling, and to change the name of the Company. The above-named Order will be amended. The Company will ask for all the powers and authorities usually conferred upon suppliers of water.

Steyning and District Water.—Authority will be sought by a company to be formed, or by certain parties to be named in the Draft Provisional Order, for authority to construct works and supply water in the parishes of Steyning, Bramber, and Upper Beeding, in Sussex. The works include a well, pumping-station, and service reservoir at Steyning, a conduit and two pipe-lines, and incidental works. The usual powers connected with the supply of water will be required by the Company.

Tendring Hundred and Clacton-on-Sea Water.—The Tendring Hundred Water-Works Company and the Clacton-on-Sea Gas and Water Company, Limited, desire to be empowered to construct works, comprising a well and pumping-station in Ardleigh and two conduits or pipe-lines, and supply water within extended limits. A Joint Committee is to be constituted; and provision is to be made for the amalgamation of the two undertakings, or of the water portions only. Additional capital and borrowing powers will be applied for.

Westbury Gas.—The Westbury Gas and Coke Company, Limited, intend to apply for power to maintain and continue their existing works and construct others, convert residuals, and manufacture and supply gas in the parishes of Westbury, Upton Scudamore, Dilton Marsh, Bratton, Edington, and Heywood-cum-Hawkeridge, all in Wiltshire. Authority will be sought to supply gas in bulk, make agreements with local authorities and others, break up roads, supply gas fittings and appliances, and levy rates and charges. The existing capital is to be defined, and more will be applied for.

Wimborne Minster Gas.—The Wimborne Minster Gas and Coal Company, Limited, will seek power to maintain and continue their existing works, construct a new holder, carry out other extensions, and manufacture and supply gas fittings and apparatus in the parishes of Wimborne Minster, Colehill, and Pamphill, in Dorset. Additional capital will be required.

Under the Electric Lighting Acts, 1882 and 1888.

Applications will be made under the above-named Acts for powers in regard to the supply of electricity for lighting and other purposes in the following places: Ambleside, Bangor (N. Wales), Barking Town, Bermondsey (with Rotherhithe and Newington), Bexhill, Blackheath, Darwen, Denton, Dorking, Droylsden, Dudley, Dundalk, Farnworth, Fulham, Galway, Garston, Ipswich, Kearsley, Leatherhead, Leith, Levenshulme, Lincoln, Llandrindod Wells, London (East and North), Morecambe, Morley, Newington, Newmarket, Pembroke, Poole and Branksome, Prescot, Ramsbottom, Redditch, Rottingdean and Ovingdean, Swadlincote, Southampton, Tenby, Tonbridge, Ventnor, Wallasey, Walton-on-Thames, Westminster, Wilmslow, Wimbledon, Withington, Wrexham.

NOTICE OF AN APPLICATION TO THE LOCAL GOVERNMENT BOARD (SESSION 1897) FOR A PROVISIONAL ORDER.

Under the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875.

Droitwich Corporation Gas.—The Corporation of Droitwich intend to apply for power to acquire additional lands for the purposes of their gas undertaking, and to erect thereon works for the manufacture and supply of gas and the treatment of residual products. Further provision is to be made in regard to the application of the revenue of the undertaking; and certain Acts are to be amended and incorporated in the draft Order.

Newhaven and Sleaford Water Company.—At the ordinary general meeting of this Company last Tuesday, the report presented stated that the revenue account showed a profit for the past financial year of £1394; and the balance available for division was £1365. The Directors recommended a dividend at the rate of 6 per cent. per annum free of income-tax, which would absorb £1020; and after placing £150 of the remaining balance to the reserve fund, the rest would be carried forward. This was agreed to.

A Water Consumers' League in East London.—An organization called the East London Water Consumers' League has been started, for the purpose of taking up the question of water supply; and a meeting was held last Wednesday afternoon, at St. John's Rectory, Stratford, under the presidency of the Archdeacon of Essex (Rev. T. Stevens), at which the subject of supply by meter was discussed. A resolution condemning the introduction of meters, as likely to lead to a disastrous epidemic, was passed; and another expressing the opinion that no legislative measure would be satisfactory to the consumers which did not vest the control of the water supply in the hands of some popularly elected body.

The Gas Poisoning Fatality at Bath.—In the "JOURNAL" last week, we recorded the death of Jessie Proudfoot at Claveston View, Bath, as the result, as supposed, of gas poisoning, and the critical condition of her mistress, Miss Decent. Unfortunately, this lady also succumbed. An inquiry into the matter last Tuesday revealed the fact that the chandelier in the parlour immediately underneath the room in which the victims slept had been drawn down too low, and allowed the gas to escape in large quantities; and this made its way into the upper apartment through a hole in the ceiling. Medical evidence showed that death in each case was due to poisoning by coal gas; and verdicts were given to this effect.

The Gravesend Corporation and the Water-Works.—At the recent jubilee meeting of the Gravesend Water Company, when, in addition to the ordinary dividend, 2 per cent. was paid in respect of back dividends on the shares issued between 1875 and 1876, and 2½ per cent. on the rest of the shares, the Chairman (Mr. M. A. Troughton, J.P.) referred to the proposal made by the Gravesend Corporation to purchase the Company's property. He stated that the Corporation had offered them £120,000 for the works. The Directors, however, were advised that such a sum was totally inadequate; and they had refused it. If an offer which was at all acceptable were made, the shareholders would be called upon to decide the issue. In the meantime, the Directors would continue to take care of the interests of the Company to the fullest extent of their ability. Acting under the advice of eminent Counsel, they had resolved to promote a Bill next session to obtain further capital and general powers.

Strike of Gas Workers at Bordeaux.—According to a Dalziel telegram sent from Bordeaux last Sunday week, all the men employed at the gas-works came out on strike on the previous day. The Mayor, fearing the town would be without light, requested General Varaigne, commanding the 18th Army Corps, to supply a sufficient number of men to keep the works going. This was immediately acceded to; and 300 soldiers took possession of the works at once. They were replaced by a night shift of 200 more soldiers. During the whole night the soldiers were in possession of the works; but, notwithstanding their efforts, the supply of gas was very inadequate. They continued at work on Sunday; the Municipal Council having decided, after a stormy discussion to keep them there until the end of the dispute. This was brought about on Wednesday by a compromise; some of the men's demands, which appear to have been for increased wages, being conceded by the Company.

Irish Incandescent Gas-Light Company, Limited.—In the report which the Directors of this Company will lay before the shareholders at their annual general meeting to-morrow, they state that the net profits realized from June 15, 1895, to June 30, 1896, cannot be considered satisfactory. But they point out that this is the first year's working, and that therefore the results do not in any way indicate the business that can be done in the future. The organization has now been put upon a satisfactory commercial basis; and as the heavy initial expenses will not be repeated, it is confidently anticipated that the working will henceforth be attended with more beneficial results. This anticipation is, they believe, justified, as the sales effected during the year under review were thoroughly satisfactory; proving that an impetus has been given to incandescent gas lighting in Ireland. An oil-lamp burning a Welsbach mantle has been acquired from the parent Company; and it is expected that it will meet with a large sale in Ireland. The accounts accompanying the report show that the trading in the above-named period produced £6267; the total on the credit side of the profit and loss account being £6331. The expenditure, including £638, proportion of advertising, and £131 (one-fifth) written off preliminary expenses, was £6131; showing a profit of £200. In consequence of a misapprehension which arose as to the result of the trading since June 30, the Auditors were instructed to investigate the accounts from the date of their previous audit, and to report to the Board. This report shows that the trading for the period from June 30 to Oct. 10 has resulted in very little profit or loss; but it is explained that at this period of the year the trade is not as good as at other seasons.

LEGAL INTELLIGENCE.

A Question as to Levying a Lighting Rate.

In the "JOURNAL" for March 24 (p. 641), we reported a case of considerable interest in connection with the making of a rate under the Lighting and Watching Act. This Act has been adopted in the village of Clowne, and a lighting rate made. Several of the inhabitants of the village, however, refused to pay it; and they were accordingly summoned for the amount. At the hearing, it was contended that the rate was bad, inasmuch as it had been improperly made; but it was argued on behalf of the Overseers that the Bench had nothing to do with this, and that such an objection should have been urged before the Assessment Committee or at Quarter Sessions. An order was made for the payment of the rate, and distress warrants were issued. Mr. G. Roberts, one of the parties, appealed to the Sessions against the order; and it was urged on his behalf that certain statutory provisions, which were conditions precedent to the adoption of the Lighting and Watching Act, had not been complied with, and consequently the Act had not been adopted in the parish. The Court admitted evidence to this effect. It was contended by the respondents that, the rate being good upon the face of it, and not having been appealed against, and the appellant being shown to be properly included in the assessment as an occupier in the parish, neither the Court of Summary Jurisdiction nor the Court of Quarter Sessions was entitled to go behind the rate, or inquire whether or not the formalities with regard to the adoption of the Act had been complied with. The Court, however, thought otherwise. Thereupon a case was stated; and the matter was recently heard by Justices Grantham and Wright in the Queen's Bench Division of the High Court of Justice. Mr. H. Etherington Smith appeared for the Overseers; Mr. Hextall represented the appellant. Their Lordships held that the ground for the decision of the Quarter Sessions—that no actual sum was specified in the resolution to adopt the Act—was not a good one, and that therefore their order must be quashed. Mr. Justice Wright remarked that it was a principle in rating law that a person could not appeal from an order for a distress warrant for non-payment of a rate on any ground on which he might have appealed against the rate itself. In this case, Mr. Roberts might have raised all his contentions on an appeal against the rate; and this was how he should have raised them. The Quarter Sessions had held that the rate was bad on the single ground stated in their order, and that was one which in law did not invalidate the rate. The reason given in the order was what the Court had to act upon.

A Gas Meter's Accuracy Impugned.

At the Leeds County Court, last Wednesday, the Leeds Corporation sought to recover from Dr. Adolf Hess, of Headingley, the sum of £12 13s. 8d. for gas consumed. The Town Clerk represented the Corporation; and Mr. Addyman appeared for the defendant. The case for the Corporation was that during the half year ending June, 1895, the defendant consumed 108,700 cubic feet of gas, the value of which was the amount claimed. Witnesses were called in support of the claim; and then Mr. Addyman said that Dr. Hess was convinced the charge was an unreasonable one, so much so, that he felt it his duty to expose its unfairness. The whole case rested on the accuracy, or otherwise, of the gas-meter. That instrument's record was, of course, *primâ facie* good evidence in support of the plaintiffs' claim; but the defendant maintained that the probabilities were against the accuracy of the meter. In August, 1894, Dr. Hess introduced the electric light into his house, and had most of the gas-fittings removed. The only appliances left for using gas were six brackets, three gas-fires, and three bunsen rings. The gas-fires were reduced to two at the beginning of 1895. Under these circumstances, it was not likely that 108,000 feet of gas would be used in the half year. Whereas the Corporation claimed for 108,000 in the first half of 1895, only 18,500 feet were registered in the corresponding half of this year; and Mr. Addyman asserted that these figures spoke volumes for his case. The defendant had paid £5 into Court—a sum he had previously tendered to the Corporation; and this would pay for about 43,000 feet. Witnesses having been called in support of the defendant's case, His Honour Judge Greenhow gave a verdict for the amount claimed by the Corporation, stating that he had not been satisfied the meter was inaccurate.

Alleged River Pollution by Gas-Works Discharge.

At the Aldershot Police Court last Thursday, the Farnborough and District Gas Company were summoned, at the instance of the Thames Conservancy Board, for an alleged pollution of the River Blackwater, a tributary of the Thames, by allowing a discharge therefrom of noxious liquid from the gas-works, and with failing to obey an order to discontinue such discharge. Mr. W. Bunting, on behalf of the prosecution, stated that a notice had been served on the Company to abate the nuisance, and three months had been allowed for the carrying out of any alterations which might be necessary; but without result. A second notice was served, and then something was done, but not very effectually. He was, however, informed that the works had been transferred to another Company; and under the circumstances, he was willing for the case to be adjourned, so that the work might be carried out. In this case, only a nominal penalty would be asked for; but in the event of nothing being done, heavy penalties would be pressed for. Professor Groves, F.R.S., said the effluent which was allowed to enter the river was of a highly impure character, and full of organic matter. It was more dangerous than sewage matter, and would most probably kill any fish in the river. The case was then adjourned for three months.

New Water-Works at Romford.—The new reservoir which has been constructed by the South Essex Water Company at Hog Hill, near Romford, has now been completed. It has a capacity of 868,000 gallons, and is situated 208 feet above sea-level.

MISCELLANEOUS NEWS.

THE MURDOCH MEMORIAL FUND.

Presentation of a Gas-Engine to Glasgow University.

The ceremony of presenting a gas-engine to the University of Glasgow, to be used in connection with the laboratory work of the Engineering Class, took place in the University Buildings on Monday of last week. The fund, it is well known, is largely due to the exertions of the late Mr. John M'Crae, of Dundee (who was Convener of a Committee whom the North British Association of Gas Managers appointed a few years ago to collect subscriptions for the purpose of commemorating the memory of William Murdoch, the "Inventor of Gas Lighting"), and of Mr. James M'Gilchrist, of Dumbarton, who has all along been Secretary and Treasurer to the fund. In 1892, the centenary of the discovery of gas lighting was celebrated by the placing, at the expense of the Memorial Fund Committee, of a bust of Murdoch in the Wallace Monument at Stirling. Thereafter, the Committee directed their efforts to the founding of a bursary or scholarship in Glasgow University. But at the meeting of the North British Association of Gas Managers in Edinburgh, last July, this object was abandoned; and the Committee were empowered to devote the greater portion of the funds at their disposal to the installation of a gas-engine, with an inscription upon it, in the Engineering Laboratory of the Glasgow University. The engine which has been procured by them is of the "Otto" type, the manufacture of Messrs. Crossley Bros., of Manchester. It is a horizontal, single-cylinder engine of 4-horse power nominal, capable of giving 9·2-brake horse power. It has a double fly-wheel, which gives great steadiness to its working. The inscription to be placed on it is as follows:—

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.
This Engine is erected as a Tribute to the Memory of William Murdoch, Inventor of Lighting by Gas (1792).
23rd November, 1896.

The description given by Professor Barr is that just now the engine is intended to drive a dynamo constructed by Messrs. Mavor and Coulson, of Glasgow, which will supply current to a battery, and that the installation will be used for the lighting of the engineering laboratories, and of the Bute and Randolph Halls in the University. The installation is a temporary one in connection with the lighting of the University buildings. When the new laboratory is built, the engine will occupy a prominent place there, in connection with the generation of power. At present the engine will also drive shafting in the first room of the laboratory directly, and in the second room the machinery will be driven by means of an electro motor supplied with current from the engine and batteries. The tools to be driven are not intended for the instruction of students, but for the preparation of specimens for instruction in the various experimental operations in the engineering class, and for the construction of apparatus to be used in the instruction of the class.

The company assembled in the University Court Room, where there were present: Principal Caird (presiding), Lord Kelvin, Sir William Arrol, M.P., Chairman of the University Extension Committee; Mr. J. M'Gilchrist, of Dumbarton, the Secretary and Treasurer of the Murdoch Memorial Fund; Mr. A. MacPherson, of Kirkcaldy, a member of the Committee of the Fund; Mr. A. Bell, of Dalkeith, President of the North British Association of Gas Managers; Mr. A. Yuill, of Alloa, the Past-President; Mr. R. S. Carlow, of Arbroath, the Secretary of the Association; and several others.

On an adjournment being made to the underground apartment in which the engine is placed, Mr. M'Gilchrist started the engine. The company were then shown its working, and also the general arrangements in the two apartments which have been assigned to the temporary use of the laboratory, and the tools which have been placed in them. On returning to the University Court Room,

Mr. M'GILCHRIST said he had very great pleasure, on behalf of the North British Association of Gas Managers, in offering the gas-engine to the University. He trusted it would be a very serviceable motor in the University; and he hoped that, when it got to its home in the new laboratory, it would do good work. He was very pleased to know that subscriptions for the new laboratory to the amount of £12,500 had been reached; and he understood that this sum entitled the University to claim another £12,500 from the Bellahouston trustees. With this fund of £25,000, he was sure that the Glasgow University would be equipped with an engineering laboratory second to none in the kingdom. He understood that the engine should be given over to the custody of the Committee of the Engineering Laboratory, associated with Sir William Arrol. He did not know that he could say more than that it had afforded the North British Association of Gas Managers great pleasure to have had to work along with Professor Barr in this matter. The Professor had been very kind; and he hoped that the workmanship of the engine would be all that he said it was—a first-class job.

Sir W. ARROL said he had very much pleasure, on behalf of the Committee in connection with the Engineering Laboratory, in accepting the handsome engine which they had had presented to them. It was practically the beginning of the new laboratory—so far, at least, as tools were concerned; and he hoped it would be the forerunner of a great many excellent tools which they would soon see working in the laboratory. This was a thing which was very much needed in Glasgow. He thought it was hardly creditable to Glasgow to be so long wanting an engineering laboratory in their magnificent University; and he hoped that the people of Glasgow would encourage Professor Barr in the work which he had begun. He had obtained, practically, £25,000 to make a start with. With this, he had no doubt they would be able to equip a fair laboratory; but he hardly thought it would, perhaps, complete it in every detail. There was always something new; and in building a new laboratory, they would require to leave room sufficient to add new tools, as the progress of engineering put them into their hands. He had not the slightest doubt that, within the next twenty years, there would be as great progress as there had been in the last twenty years in the engineering science in this country.

Principal CAIRD offered, on behalf of the University, his best thanks for the valuable gift which had been conferred upon them. It was only one of a long series of similar and even more splendid benefactions which had been due to the liberality of the leading citizens of Glasgow and the heads of the great engineering firms on the Clyde. The Engineering Laboratory itself—to name no other of those benefactions—was greatly due to the liberality of those whom he had named. They knew much better than he could tell them how important an element in the formation of an Engineering Laboratory would be the gas-engine which they had just bestowed upon them. For one thing, to begin with, it gave them the means of generating electricity for the lighting of the laboratory itself, and of the Bute and Randolph Halls; and ultimately, he would fain hope (perhaps with the assistance of another similar gas-engine), of the whole of the various class-rooms—for their need of substituting electricity for gas was a very great one there. But besides the utility of the engine, the engine and the dynamo that was to be placed upon it, would serve to commemorate a Scottish engineer of great ingenuity and activity of mind, whose memory, though he had long since passed away, was still cherished by many for his ardent devotion to engineering science, for his single-minded activity and love of truth, and for his important contributions to engineering, and especially to the structure of the steam-engine while he was the colleague of Watt. And he recalled the fact that to Murdoch was due the introduction of the system of illumination by gas—a system the benefits of which had, through the past century, been almost inestimable, benefits which it had conferred, not only on this country but on every nation in the civilized world. No memorial of such a man could be more fitting than that which they had so liberally bestowed upon them.

Lord KELVIN said he was most agreeably reminded by what had been before them that day, of a pleasant meeting at Stirling in July, 1892, when he had the honour of unveiling a statue to William Murdoch, which had been placed there, in the neighbourhood of the statue to William Wallace, as one of the perennial memorials of men who had done great things for Scotland. Murdoch, as had been pointed out, had done great things for the whole world. And now, at the end of the century, just about, in round numbers, a hundred years after Murdoch began to introduce gas for lighting, gas was becoming, he would not say superseded in respect of lighting, but they had the prospect of its being largely superseded; and he did not think it was, perhaps, too much to say that, at some time or other, the lighting of cities would be done very much more by electricity and much less by gas, than they were just now. But still they were, to some degree, superseding gas as a direct illuminant. The "Murdoch Memorial Gas-Engine" in the University would be a perpetual memorial that gas had not completed its work when it had done all that could be done in the way of lighting directly; but that it was now being largely used for driving machines which produced light by electricity, and that there was a prospect of this application of gas being greater and greater. He thought the North British Association of Gas Managers might be very happy indeed in the prospects now provided for gas, for it was doing more, he believed, in the way of lighting, notwithstanding what electric light was doing. It was now being yoked to machines to produce electricity; and there seemed every prospect that this use would increase. So that, however much might be done by electricity in the future, he saw nothing but prosperity and augmented work for the gas manufacture of the United Kingdom and, he might say also, of the world. He wished to join in the opportunity of heartily thanking the North British Association of Gas Managers for their great kindness in presenting the engine that had just been started. He felt it to be a particularly happy association that the first part of the Murdoch Memorial should have been his statue, and that another part should be the presentation of a gas-engine to the University.

Professor BARR said that Sir William Arrol had thanked them on behalf of the Engineering Laboratory Committee; the Principal had thanked them on behalf of the University; Lord Kelvin, he thought he might hold, had thanked them on behalf of the Senate of the University; and perhaps they would allow him to thank them on the more limited footing, as representative of the Engineering Department of the University. He thanked them very heartily indeed, for placing in their hands, not only one of the most useful pieces of experimental apparatus which they could possess, but also a memorial of one of the greatest of Scottish engineers. He hoped that the example would be the first of other gifts of a like nature; for no more fitting memorial of great engineers could be had than the establishment of such tools in the hands of those who had to carry on the work of the education of the young. He thought it was not at all inappropriate that a memorial to Murdoch should take the form of an appliance which would be used, more or less, for the purpose of superseding gas as an illuminant. Lord Kelvin had referred to the fact that gas was doing the work of lighting, although it was not, in all cases, doing it directly. But independent of this, he thought they might hold that Murdoch was one of those characteristic inventors who were never satisfied with anything which had been attained; and that, had he been with them that day, as one of their leading engineers, without the slightest doubt he would have been one of the very first, as well as the most hearty, to adopt the newer and superior mode of illumination. He wished also to thank all those who had taken so great an interest in their engineering laboratory movement. They were that day, practically, opening a very small and temporary laboratory; but funds were now available for providing a perfect laboratory, and he hoped the University Court would soon fix upon a site for it, so that they might get on with the work of erecting it.

Mr. ANDREW STEWART proposed a vote of thanks to Mr. M'Gilchrist for his labours in connection with the matter before them. When the subject was first brought before them, there was considerable difficulty as to the form the memorial should take; but they all felt it should be something to assist Mr. Barr. It was due to Mr. M'Gilchrist that it had taken the form it had.

Mr. A. MACPHERSON proposed a vote of thanks to Principal Caird for presiding. He explained that it was the intention of the Murdoch Memorial Fund Committee to have founded a scholarship in Glasgow University. But they had been unable to accomplish this object; and

they thought that the next best thing they could do was to place a gas-engine in the University. The Memorial Committee had had very great pleasure in doing this; and they hoped it would prove a useful tool in the Engineering Laboratory.

Professor BARR wished also to express the thanks of the University to Mr. Andrew Stewart for the very great interest he had taken in this matter. But the thanks of the University were also due to him in other directions.

Principal CAIRD was sure that all his colleagues would heartily agree with the proposal of Professor Barr. Mr. Stewart, as they all knew, was not only a participator in this movement, but was a most important benefactor to the University.

At the close of the proceedings, the company were entertained to tea by the Principal.

MATLOCK BATH GAS-WORKS ARBITRATION.

Matlock Bath—Saturday, Nov. 21.

(*Before Sir* WILLIAM CODDINGTON, *Arbitrator.*)

The proceedings in the above arbitration were continued to-day at the Bath Hotel, Matlock Bath.

Mr. LEWIS COWARD and Mr. HEXTALL appeared for the Company; while Mr. BALFOUR BROWNE, Q.C., and Mr. RAM represented the District Council.

Mr. *J. E. Lawton*, examined by Mr. RAM, who said he was a cotton spinner and thread manufacturer, and the managing partner of Sir Richard Arkwright and Co., the proprietors of the Masson Mills, was the first witness. He said he was a member of the Yarn Committee of the Manchester Chamber of Commerce. The object of the Committee was to advise as to foreign trade, and as to treaties made in respect to cotton. He had also been Chairman of the District Council of Matlock Bath. In the year 1895, the consumption of gas at the mills was 6,390,500 cubic feet, which was 41·69 per cent. of the total gas sold by the Matlock Bath Gas Company. They commenced "gassing" yarn in 1886; but they did not get anything like a full production until 1888. He had prepared a table showing the growth of the manufacture from 1888. From 1889 to 1894, the gas consumption at the mills increased from 24,094 to 6,346,900 cubic feet. In the year 1895, there was a stoppage of the large wheel. On June 27, 1895, the firm wrote to the Gas Company for a reduced rate. The Company replied that they could not supply them with gas at a profit at such a price as 2s. 4d. per 1000 feet; and they pointed out that they reduced the price to the mills in 1893, and a further reduction of 2d. per 1000 feet was allowed on Jan. 1, 1895. The letter concluded with the assurance that if at the end of the year's working a further reduction was warranted, Masson Mills would receive the first consideration. At the following general meeting of the Company, the Chairman said they had had the most prosperous year they had ever experienced; and, therefore, on March 2 of this year, Messrs. Arkwright wrote again asking for a fulfilment of the promise of a further reduction, except for which they would have accepted the offer of another Company, who were willing to supply gas at a less price. They had adopted hot water for cooking purposes at the mill instead of gas; and they were talking of gradually removing the "gassing" yarn department from Masson Mills to Mellor, where they had gas plant of their own. They had introduced a new burner for "gassing;" and it made a reduction of over 20 per cent. in the amount of gas consumed. As Chairman of the District Council he had done all that was possible to come to an agreement with the Gas Company as to purchase. Before going into the House of Commons, they offered £11,500; and in the House this offer was increased to £13,000.

Cross-examined by Mr. COWARD: The difference between 2s. 4d. and 2s. 8d. per 1000 feet in the price of gas would make a difference of £106 directly and £250 indirectly.

Mr. COWARD: Was there a profit on last year's working of the mills?

Witness: I shall be very happy to show the Arbitrator the private ledger of the firm; but I decline to tell you or the public more of my business than is reasonable and fair.

In the House of Commons you made complaints against the Company as to bad gas, high prices, and so forth. You do not make them now?—They have been on their good behaviour for the last twelve months. The quality of the gas for the last nine months has been decidedly better.

The ARBITRATOR: Is there any difference between a low-grade gas and a high-grade gas for "gassing?"

Witness: The higher the quality, the better the "gassing."

Mr. *W. Jaffrey*, Surveyor to the Matlock Bath Urban District Council, said the total area of the gas district was 5125 acres. The population in the year 1881 was 4660; and in 1891, 4785. It was now estimated at 4860.

Mr. *E. H. Stevenson*, M.Inst.C.E., said he had examined and inspected the Matlock Bath Gas-Works. Generally speaking—in fact, almost entirely—the plant was new. The only old portions appeared to be a block of buildings, forming the cottage, retort-house, coal-shed, lime-stores, and engine-house. He did not consider the site a good one; but he had not allowed anything in his valuation, owing to the fact that the works were to be abandoned. The principal thing he had considered was the future of the Company. He had examined the quantity of gas sold to ordinary consumers for a period of five years; and he found it had decreased. It was 1·89 per cent. for the ordinary consumers, and 0·89 per cent. for the large consumers.

The ARBITRATOR: That is excluding the stoves?

Witness: Yes.

Examination continued: The consumption by stoves had increased; and if the 2·1 per cent. per annum increase there could be continued, it would be just satisfactory—nothing more. He did not however, see how it could be continued. They had 70 cookers out in the district, which was a large proportion; and these gave a consumption of gas of 1,402,000 cubic feet, which was equal to 20 per cent. of the gas sold to ordinary consumers. There were about six consumers with stoves and no separate meters; so that the decrease in ordinary consumption was more marked than it appeared. They knew from Mr. Lass's figures that Masson Mills took 41·69 per cent. of the gas sold; and he considered that made the position of the Company very peculiar, as it added to the risk of the business. The result of Masson Mills ceasing to take gas would be a serious diminution of revenue, and an increase in the cost per 1000 cubic feet. It would hit the Company both ways. The whole profit they made on the sale of 6 million cubic feet would be lost. The unaccounted-for gas had been increasing during the last three years very rapidly. This pointed to serious neglect in the management of the Company—carelessness in regard to the mains. The explanation that one year they were making new works, and further that the old gasholder leaked, was not sufficient. In alterations of gas-works, if they were properly made, generally the gasholder, condenser, and scrubber connecting up to the old pipes would probably be put down by the contractor's men; and there should be little loss of gas. The quantity of gas which was in the old apparatus would be lost; but the leakage ought not to be seriously increased. The statement prepared by the Company showed a leakage by the old gasholder of 5 00 cubic feet per week.

The ARBITRATOR: What is the total amount of leakage?

Witness: Some 3 million cubic feet. Even if the old holder does account for 5000 cubic feet per week, it is absurd and bad management to allow it to continue for any length of time. The leakage, in my opinion, is due to defects of mains; and it will have to be put right at the expense of the purchaser.

Mr. BALFOUR BROWNE: Do you agree with the three experts called on the other side—Mr. H. E. Jones, Mr. Newbigging, and Mr. Corbet Woodall—that the way to start in a case of this kind is not to show the actual profits, but the maintainable profits?

Witness: Certainly: I should not take the profits as shown in the balance-sheet, but the maintainable profits, corrected for or against the Company as the case may be.

Now start with the profits of 1895—£801 17s. 3d. That is the figure admitted on both sides. In your view, is it possible that this can be maintained?—No; it is absolutely impossible that for a course of years it can be maintained. I think it ought to be corrected on three points. In the first place, I find an insufficient charge for repairs. The charge in the accounts is 3·76d. per 1000 feet; but repairs and renewals in a works of this size cannot be done under 6d. per 1000 feet. It is almost invariably the practice to allow 5d. for works of very much larger size; and I always find the repairs on small works, like everything else, cost by comparison more than on big ones. According to my view, the 3·76d. is too low by 2·24d. Working this out upon the 13,330,000 cubic feet of gas sold, this will add to the expenses £143 1s. 7d. per annum, which must be deducted from profits. In the accounts, 2·43d. per 1000 cubic feet is allowed for carbonizing; and I think 4d. to 5d. is about the ordinary figure in small works of this kind. In "Field's Analysis," it is shown that most of the companies are worked at a higher rate than these accounts prove; and therefore I think I am not dealing unfairly with this Company in charging them 3d. I have added 0·57d. to this item; and on the year this makes a difference of £36 8s. It is not, in my opinion, a proper suggestion to add anything to repairs and renewals from the wages of the Manager. The only formula known among us is according to Schedule B of the Gas-Works Clauses Act; and in that, the manager's salary is kept separate. The working expenses of the Company come out to 12·68d. per 1000 cubic feet, as against 15·70d., the average of the London Companies.

And therefore this 12·68d. would have to be corrected just in the way you have corrected it, by allowing £143 1s. 7d. for repairs and renewals, and £36 8s. for wages and carbonizing?—Yes; this would come to 15·49d. per 1000 feet, or an increase of 2·81d. upon the 12·68d.

Mr. Jones has put the fall in residuals this year at 20 per cent. In your opinion, is that a temporary fall?—It might be in some cases; but a large portion of it, I think, is permanent, because we find the fall in the price of ammoniacal liquor and sulphate of ammonia is almost coincident with the increase in the output of sulphate of ammonia, and the output is continuing to rise. I have not allowed such a large amount as Mr. Jones; I have only one-twelfth, instead of one-fifth. I consider there will be a considerable permanent loss; and this will make a difference to the profits of £31 8s. 9d. These three figures come to £211 8s. 4d.; and I have deducted that from the £801 17s. 3d., which leaves £590 8s. 11d. This would be the maintainable revenue if the Company were in an ordinary position, and there were no Masson Mills, but all the revenue was obtained from ordinary consumers, cookers, and things of that sort. The profits, however, must be further reduced. I have allowed 20 per cent. for the new burners at Masson Mills; and this would further reduce the profits by £25 17s. 8d. Then if the price of gas is lowered by 4d. per 1000 feet, so as to allow the mills to continue "gassing," this will further reduce the profits by £67 13s. 8d. The reduction in relation to Masson Mills is, therefore, £93 11s. 4d.; and this brings the maintainable profit to £496 17s. 7d.

Now I come to the question of the multiplier. It occurs to me that these two parts to the business—the ordinary consumers and the supply of the mills—are not equally well secured. Have you, in considering the multiplier, taken this into account?—Yes; I have. I have considered the security of the one as against the insecurity of the other. I have also taken into account that you can invest in a non-statutory company to pay 5 per cent. That is 20 years' purchase; and so far as I am aware, there has been no award in an open arbitration of more than this number of years' purchase. I have put the multiplier here at 18 years, because a portion of the profit is derived from the Masson Mills, and may go at any moment from a variety of causes.

Cross-examined by Mr. COWARD: He had considered the maintainable profit, and not the profit shown on the Company's balance-sheet. As a general rule, he put the difference between the value of a statutory and a non-statutory company at five years' purchase. The difference used to be 3½ years in the times when gas companies sold on the 6 per cent. table. It was then 16⅔ years' and 20 years' purchase. Then it rose to statutory companies having 25 years' purchase; and non-statutory ones, 20 years'. Of course, every case had to be considered upon its merits. He agreed with Mr. Shiress Will, who said that more than 25 years had been given in many cases; but he had never heard of a case where over 30 years' purchase had been given. The Stafford Corporation had to pay 29 years' purchase in 1876; but

the Stafford Company got more than they were entitled to. St. Helen's only obtained 22¼ years' purchase; and this showed how uncertain these certainties were. At Burslem the Local Board paid 28·22 years' purchase for the gas-works; but this was by agreement. Very often facts came out in an arbitration which entirely upset preconceived ideas. It was like that in the Chesterfield arbitration. Colne was a non-statutory Company; and 23·7 years' purchase was paid in 1877. At Stourbridge, in 1893, 28 years' purchase was given. This was a statutory Company.

Mr. COWARD: Ilkley was sold at 30 years' purchase, was it not?

Witness: Nothing approaching it; and it was purchased by agreement.

Did not Mr. Newbigging arrange the sale?—I do not know.

If he instructs me that it was 30·93 years' purchase, will you dispute it?—I say he is absolutely wrong; and I will give you the figures. The capital was £2100 on 10 per cent., and £18,100 on 7 per cent. standard dividends. They were dividing at the time 13⅛ and 10½ per cent. respectively upon these capitals, under the sliding-scale; and the amount of the dividends was £2148 a year.

The dividend for the year ending June 30, 1892, amounted to £1778?—I say it did not. I take this from the Company's returns to the Board of Trade; and I know they are right. Assuming the £1778 was correct, the amount paid would be equal to 30·93 years' purchase.

Are you acquainted with the circumstances of Rhyl, a non-statutory Company?—To a certain extent I am. There was an agreement there. I have heard it said it was 20 years' purchase.

Was not the Company taken over at 23·8 years' purchase?—That, again, depends on whether the figures are correct. Mr. Newbigging, who was the Engineer, has told me they ought to be correct. Afterwards, however, the facts were stated before the Board of Trade Inspector; and the purchase was certainly agreed upon figures which were not correct.

The Company received a lump sum of £32,000; and the balance of profit was £1345?—The balance of profit, as stated by the Engineer to the Local Authority before the Government Inspector, was £1826.

Did the balance-sheet show a profit of £1764?—No. The evidence was published in the "JOURNAL OF GAS LIGHTING," and given by Mr. Hepworth, who, I presume, had an honest case.

Mr. BALFOUR BROWNE objected to this evidence, as he did not know where the statements were taken from.

The ARBITRATOR: He says the £1764 on the balance-sheet was reduced to £1345.

Cross-examination resumed: He thought £11,500 was a reasonable offer for the Matlock Bath undertaking. He advised increasing it to £13,000 ultimately, in order to stay litigation and prevent further expense. He calculated the maintainable profit at £676 10s.; and this, multiplied by 17 years, would give £11,500. This was based upon the 1894 accounts. As to Mr. Newbigging's statement that taking the Provincial Companies in England for ten years, the average cost per 1000 feet for repairs was 4·42d., and for meters 0·56d., he (witness) thought it was absurd to compare such a small concern with companies that had to supply 259 million cubic feet a year. The smallest of the companies Mr. Newbigging referred to produced 250 million feet a year. He would give exactly the same answer to Mr. Woodall. The 2·43d. for carbonizing should be 3d., even if they worked on eight-hour shifts, and without any machinery. It might be 2½d. at Matlock Bridge; but he should imagine the carbonizing expenses were wrongly allocated at Matlock Bridge, as they were at Matlock Bath. There had been a rise in sulphate of ammonia, but there had been a falling off in coke, which was by far the chief item. As shown by Mr. Lass's accounts, the cost of the gas made by the Company was 2s. per 1000 feet; but if the 41 per cent. of the gas made which was supplied to the mills were knocked off, the cost of gas to the Company would be at least 2s. 6d. per 1000 feet. He thought that the extent of the leakage pointed to neglect. If the mains were in bad condition, of course the greater the pressure the greater the leakage. The difference in the size of the pipes conveying the supply to Masson Mills should not create leakage, nor the dislocation of the works to any great extent.

The ARBITRATOR: I see it rises from 9 per cent. to 12¼ per cent. in 1894, and to 16½ per cent. in 1895?

Witness: Yes; and it looks as if neglect were going on.

Mr. COWARD: Is there no prospective value in this case?

Witness: I do not see the slightest hope for prospective value. The population is practically stationary; and the place is fully built over.

If the undertaking is worth 30 years' purchase, why should we not have it?—There is no non-statutory gas undertaking which is worth so much.

Re-examined by Mr. BALFOUR BROWNE: The cost to produce gas, apart from the domestic supply, was 22·57d. per 1000 feet. According to Mr. Jones's claim of £27,269, and taking the Company's profit at £802, it brought out 34 years' purchase, which was rather more than in the case of Chesterfield. Several cases where agreements were made had been quoted; but agreements for the sake of peace ought not to be taken as indications of revenue. The £13,000 offered was much more than the value of the Matlock Bath undertaking.

By the ARBITRATOR: He estimated the cost of gas to the Masson Mills at 22·57d. per 1000 cubic feet, and to the other consumers at 25·15d., which, on the average, worked out to 24·07d. per 1000 cubic feet, estimating the profit to be as stated in the balance-sheet. According to the Company's books, £3484 had been spent upon the works since 1893; but of this £900 or £1000 ought to have been written off for the cost of the old plant.

Mr. *W. R. Chester*, M.Inst.C.E., said that he had had 25 years' experience in the management and valuation of gas-works in London and the country. As to the unaccounted-for gas, he had no doubt that it was due to the severe frost at the beginning of 1895. It was evidence of bad management that the mains had not since been repaired. There were over 10,000 yards of mains; and it would cost 1s. per yard to strip them, if it was necessary. His opinion was that the minimum cost for carbonizing was 3d. per 1000 cubic feet. In a great majority of cases, it went up as high as 4d., and even to 5d. per 1000 feet. In Nottingham it was 3·89d. per 1000 feet; and they had machinery in operation. The wear and tear could not be covered under 6d. per 1000 feet. There had been a large reduction in the price of residuals. Coke had fallen by 1s. to 2s. per ton; and taking it at the minimum of 1s., there would be a reduction of £29 16s. on the Company's returns. Sulphate of ammonia had fallen from £8 10s. at the beginning of this year, to £7 2s. 6d. That worked out, on the Company's production, to £7 6s. 3d.

The ARBITRATOR: But there is a statement that sulphate of ammonia has risen a little.

Witness said the explanation was this: He happened to be a member of the Sulphate of Ammonia Manufacturers' Association. Prices went down to the rock bottom, at which manufacturers could come together to lift them up. A meeting of large sulphate manufacturers took place at the beginning of the present month; and it was rumoured abroad that some step was being taken. The market responded; and the price had risen a few shillings per ton. It now stood at £7 10s. With regard to sulphate of ammonia, however, he believed the fall was a permanent one. Large increases of production were taking place. Collieries were putting down plant for the recovery of the bye-products in the coking of coal; and the iron-workers were also recovering the ammonia from their blast-furnaces.

Examination resumed: With regard to coke, so long as the price of coal remained at anything like the present figures, he did not think they had touched bottom prices. There would be no rise for some time. He started with the profits of the Matlock Bath Company at £801 17s. 3d. From this he deducted, for insufficient provision for wear and tear and renewals, £179 9s. 9d., which was arrived at by multiplying the number of feet produced by 2·81d. He further deducted £37 2s. 3d. for reduced value of residuals, which brought the profits down to £585 5s. 3d. He then took off £25 7s. 6d. for saving of gas at Masson Mills by the new burner, and £67 14s. for a reduction of 4d. per 1000 feet in the price of gas there. This gave a maintainable profit of £492 3s. 6d.—or, roughly, £500—which he multiplied by 18 years' purchase. This worked out at a total value of £9000 for the works. If it had been an undertaking of an ordinary character, supplying gas to a large number of small consumers, and non-statutory, he would have taken 20 years' purchase; but as 42 per cent. of the supply was taken by one customer, it was only reasonable that this figure should be reduced in consequence of the extra risk.

Cross-examined by Mr. COWARD: Wear and tear could not be covered by less than 6d. per 1000 feet. He had the figures for Nottingham for 1894-5-6; but not for ten years. He could not say that it had not cost 5·10d. per 1000 feet for the decade. In 1894, it was 6·09d.; in 1895, 4·81d.; and in 1896, 5·54d. He had known of no works properly maintained at a cost of 4d. per 1000 feet. When a third of the supply was taken by one customer, the cost of repairs and renewals ought to be lower; and if it had not been for this fact, he should have put the wear and tear at a higher figure. He had never heard of such a thing as including the manager's salary in the expenses of wear and tear; it was an extraordinary suggestion. As to the leakage, he thought it was an absurdity to pretend that this could take place at the works. They might take it that there was an enormous leakage of gas in the distributing plant of the district. The rise in the price of sulphate of ammonia was owing to a speculative tendency in the market. The dealers were under the impression that there was some kind of a ring being formed, and that prices would go up. They ran in and purchased large quantities, which had the effect of sending the price up 7s. 6d. per ton in a week. There was no reason why this should continue.

The ARBITRATOR: That is entirely your opinion?

Witness: Yes; and it is based on a certain knowledge of the market, and what is influencing it.

Mr. COWARD: These are purely hypothetical opinions. Now, taking into account the reduced value of money at the present time, has it not been the custom to considerably increase the number of years' purchase?

Witness: Yes; on the basis of 5 per cent.

By the ARBITRATOR: The leakage at the Nottingham Gas-Works was between 5 and 6 per cent.

This concluded the evidence, and Counsel then replied.

Mr. BALFOUR BROWNE, for the District Council, said they started with maintainable profits, and they made certain deductions; and it was for the Arbitrator to judge whether they were fair or not. He appealed strongly for costs to be allowed to the Council, who had been forced into a ruinous contest.

Mr. COWARD replied on behalf of the Company, and criticized Mr. Balfour Browne's appeal for the costs; remarking that it would be an almost unheard-of thing if the Company were not awarded the costs of the arbitration. The greater part of the case put forward by his learned friend was based upon absolute hypotheses. The facts and figures, the repairs and renewals, and the cost of carbonizing, he could deal with; but when he came to the other figures, they were nothing but shadows—the shadows of an irresponsible expert put forward with a feeling which did not do him credit. He asked the Arbitrator to contrast the evidence of Mr. Stevenson with that given by Mr. Jones, Mr. Newbigging, and Mr. Corbet Woodall. These gentlemen were of the highest repute; and after Mr. Stevenson had said that their evidence was nonsense, he thought the Arbitrator would look very carefully indeed at the figures put forward by a gentleman descending to such language. Having reviewed the evidence given, he asked that problematical theories should be placed on one side, and the evidence of the three gentlemen he had called relied upon. The usual course was to give 10 or 15 per cent. for compulsory sale; and he saw no reason why this should be departed from in the present case. As to the multiplier, he trusted the Arbitrator would give the claimants something between 20 and 26⅔ years' purchase—say, 25 years.

The ARBITRATOR thanked Counsel for the ability with which they had presented the facts to him, and stated that he would require a few days to consider his award.

The proceedings then terminated.

Transfer of the Farnborough Gas-Works.—We understand that the Aldershot Gas Company have purchased the Farnborough works of the Farnborough and District Gas Company.

BIRMINGHAM CORPORATION GAS SUPPLY.

Official Changes—Collection of Accounts—Prepayment Meters—Increased Consumption of Gas.

In the course of a report which the Gas Committee will submit at to-day's meeting of the Birmingham City Council, they announce that Mr. A. P. Ker, the Superintendent of the Windsor Street Gas-Works, retired on Oct. 1 on the superannuation allowance to which he was entitled from the fund of the Gas Department, and to which he had paid 27 years' contributions. To meet the vacancy and that occasioned by the death of Mr. Milne, the late Superintendent at the Adderley Street works, the Committee have appointed Mr. T. F. Ennis, Assistant Manager of the Nine Elms works of The Gaslight and Coke Company, to succeed Mr. Ker, and Mr. E. L. Pryce, who has for nine years been Analyst at the Windsor Street works, to take the place of the late Mr. Milne. Referring to the recently authorized extensions of carrier mains in the Stratford Road, the Committee report that before these had been completed, applications were received for a further large supply of gas to new manufactories about to be built in the neighbourhood; and, to meet these requirements, an additional expenditure of £1200 was sanctioned in carrying the enlarged main beyond the area provided for in the original estimate. Referring to the branch collections which were established for the benefit of consumers paying small amounts and not able to do so conveniently by remittance, and also with a view to the relief of the pressure in the pay months on the central office, the Committee remark that, having learned that payments of large accounts, both for gas and residuals, were being made by cheque at some of the branch collecting offices, they have informed the collectors that commission on collection cannot be allowed in respect of any amounts which are paid to them by cheque. It appears to the Committee that the payment of cheques to the branch offices cannot add to the convenience of consumers, nor does it relieve the work of the central office. A tender of £1438 has been accepted by the Committee for the erection of a meter-testing station in Sheep Street. On the subject of prepayment meters, the Committee mentioned that the number now connected is about 2000; 1000 of them having been fixed during the summer months. The Committee have during the past year given preference to applications for these meters from the streets in which such meters have already been fixed, in streets adjacent thereto, or in streets from which at least five applications are received. By the adoption of this system, they have been able to reduce in a large measure the disproportionate cost of collection which was experienced in the first year, when meters were fixed on the application of single consumers in any part of the city. They will continue in further issues to direct their attention to this point, as economy of collection is essential to the complete success of the system. Contracts have been made at satisfactory prices for the coal required in the current year. The price to be paid for tar, under contract, has also been fixed; and this residual will yield a slightly increased revenue this year. The statistics for the half year ended Sept. 30 show that there was a sale of 1,595,459,800 cubic feet of gas, as against 1,430,478,200 cubic feet in the corresponding period of 1895—giving an increase of 164,981,600 cubic feet, or 11½ per cent.

THE FALMOUTH CORPORATION AND THE GAS AND WATER WORKS.

Defeat of the Purchase Scheme.

At a Meeting of the ratepayers of Falmouth held yesterday week, the proposal of the Corporation to promote a Bill next session for the purchase of the local gas and water undertakings was rejected by a practically unanimous vote. The decision was arrived at amid a strong display of personal feeling both among members of the Council and outsiders. Before the ratepayers' meeting, there was a private and informal assembly of the Town Council, at which it was stated that the cost of preparing and printing a Bill and of taking a poll of the ratepayers would amount to £2000 or £3000. In view of this, and of the hostility to the scheme, it was suggested that the proposal should be dropped. Some of the members, however, strongly objected to a withdrawal of the scheme at this stage; and a noisy meeting came to an end without arriving at any formal decision. There was a crowded attendance at the ratepayers' meeting; and in order to accommodate all who were present, it was necessary to adjourn from the Town Hall to the Volunteer Drill Hall. The proceedings throughout were excited and uproarious.

The Mayor read a resolution in favour of the promotion of the Bill, and added: Now it is for you to say yea or nay; it is all the same to me.

Mr. Coward put in succession a number of questions as to the profit on the gas and water works and the condition of the undertakings.

Mr. J. Grose, the Chairman of the Gas and Water Committee, in reply, said the total profit on the gas-works last year was £2333. The water-works showed a loss. If any of the mains required renewing, this would be done. The assumption that it would take all the profit to pay for renewal of mains, and that there would be no funds to pay the interest on the purchase-money, was absurd.

Mr. Coward believed they were all acting on assumptions as far as the water-works were concerned. If the profits on the gas had to be taken to meet the loss on the water, the money for the repayment of loans and interest must come out of the rates.

Mr. J. G. Cox, the Manager of the water-works, who said he was interested as one of the biggest ratepayers and gas and water consumers in Falmouth, contended that the proposed enormous expenditure was unjustifiable. Had the Council placed before the ratepayers such clear and distinct statements as showed that the purchase would without doubt result in a profit; and did members of the Council possess such experience and qualifications as made it safe to entrust them with such an enormous increase in their already onerous duties? Was it not almost certain that electricity would supersede gas, and leave Falmouth in a few years with nothing for its outlay? Had they any reliable ground for anticipating the avoidance of a heavy yearly loss on the water-works; and could they believe the management would be satisfactorily looked after by those who knew nothing about it? Due consideration had not been given to these things. Was it not inevitable that rates would increase. If not, where was the deficit to be made up from? They had been told they would not pay so much for water; but this would make the water-works less favourable.

Mr. T. Mitchell, who said that the local rates were already 7s. 10d. in the pound, moved, as an amendment, that the resolution be "thrown into the sea."

Mr. R. Fox remarked that, up to this point, they had not had a single speech in favour of the scheme. The gist of the whole business was whether they were likely to get a profit which would lessen the rates; and they had nothing yet to prove that this was likely. Many points had not been looked into at all, for they had only had a month to master the whole position, though they were asked to make the town responsible for something like £100,000. It was quite possible that the time would come when it would be wise for the town to acquire the water supply; but it had not yet arrived. With regard to the gas-works, consumers would be glad to see their bills lowered; but they were there as ratepayers, and not as gas consumers. The cost of the Act of Parliament, arbitration, &c., would be £4000 or £5000; and this would have to be paid off within ten years, and not in forty or fifty years like the purchase money. They ought to have, must have, and would have time to consider the matter; and, if an amendment had been in order, he should have proposed the postponement of the question for a year.

Mr. Bowles, a town councillor, also advised delay.

On the motion being put, not a single hand was held up in its favour; and the great majority voted against it. A poll was demanded, but the demand was afterwards understood to be withdrawn; and the proceedings which became very confused, were terminated by the turning out of the gas-lights.

On the following day, there was another informal meeting of the Town Council, at which there was considerable discussion as to whether a poll was really demanded at the close of the meeting on the previous evening. The Mayor thought it would be of no advantage to incur further expense, after the decisive vote of the ratepayers. Mr. Collins thereupon moved, and Mr. Truscott seconded—"That, in view of the expression of opinion at the public meeting, the Council proceed no further in the matter." On a vote being taken, eight were in favour of this resolution, and one against it; while two members of the Council remained neutral. It was arranged that a special meeting of the Council should be held to confirm this decision.

THE TEIGNMOUTH DISTRICT COUNCIL'S GAS-WORKS.

An Offer to Purchase.

The Teignmouth District Council have had considerable trouble over their gas-works, which at least one of their number is never tired of saying cannot possibly be made to pay; and at their meeting on Tuesday last, they were afforded an opportunity of disposing of the concern, and ridding themselves of what in some quarters is regarded as an undesirable property. A letter received from Messrs. R. & J. Dempster, Limited, of Manchester, stated that one of the Directors had been staying at Teignmouth, where he gathered the impression that some members of the Council would be disposed to consider the question of the sale of the works, if a purchaser could be found who would be prepared to carry out the necessary extensions so as to maintain a proper supply of gas. They were ready to purchase the works, mains, meters, services, and the whole property of the Gas Department, for the sum of £10,000, and would pay the money down and take over the works at any date. They would guarantee to erect new gasholders, and carry out other extensions, besides laying new mains, and doing everything else necessary to put the works in first-class order; and they would not charge any more than the present price (3s. 9d. per 1000 cubic feet) so long as coal remained at current prices. The extensions and new mains they would further undertake to complete before the winter of 1897, so as to give a thoroughly good supply of gas. In the course of the discussion which took place upon the offer, the Chairman (Mr. T. W. Hutchings) remarked that it showed the gas-works were worth something. To this Mr. Harris, the Chairman of the Gas Committee, added that it was satisfactory to know that £10,000 had been offered for the works, the mortgage debt upon which stood at less than £9000. Mr. Jarvis, the most persistent critic on the Council of the administration of the Gas Department, asked whether it would be necessary to get an Act of Parliament before they could sell. The Clerk said he did not think it would; but he did not believe the Local Government Board would allow them to sell. He did not know that they had the power to sell, even if they wished to do so. It was decided to thank Messrs. Dempster for their offer, and to state that the Council were unable to entertain it. The need of an improvement in the supply of gas was shown at the same meeting of the Council in a memorial from the tradesmen in the principal streets, as well as in a letter from another person calling attention to the matter, and stating that oil-lamps had to be used to make up for the deficiency in gas-light. Mr. Harris said the chief cause of the complaint was the inadequate pressure, and not the poor quality of the gas. The Chairman said the remedy would be to extend and improve the plant at the works, put down a larger main from them to the town, and relay the mains in the principal streets. It was decided to refer the matter to the Gas Committee; but subsequently, on a motion by Mr. Wheatley calling attention to the financial condition of the undertaking and the unsatisfactory position of the gas supply generally, it was decided that the question should be considered by the Council in Committee.

Reduction in Price.—The Sandwich Town Council have resolved to reduce the price of gas for cooking purposes to 3s. per 1000 cubic feet.

LANCASTER CORPORATION GAS SUPPLY.

In moving the confirmation of the minutes of the Gas Committee at the meeting of the Lancaster Town Council last Wednesday, the Mayor (Mr. Helme) announced that there had been the satisfactory increase of 2¾ million cubic feet in the consumption of gas during the past six months, as compared with the corresponding period of last year. A lower price, however, had been charged for the gas; and consequently the larger quantity sold only produced an additional £113. If they had sold the gas at the former price, the increase would have been £342; but in spite of the reduced charge, they were able to report an advance in respect of ordinary meters, while prepayment meters had also increased and continued to show satisfactory development. In the sale of chemical products, there was a reduction, arising from the fact that in the previous year they started with a large stock, whereas this year they finished with a bigger one. If an exact comparison of the sales and stocks were made, it would really show an increase of £150 this year, as compared with last year. The quantity of coal carbonized had increased by 209 tons; and they had a decrease in the cost of £159. So that, in every respect, the working of the Gas Department might be said to be in a very satisfactory condition. Regarding the Alkali Works Regulation Act, the Inspector had some time ago called the attention of the Manager to the desirability of sooner or later putting the works into better form; and the Council were now asked to sanction the expenditure of about £100 to make the necessary alterations in order to put the works in a position to comply with recent regulations. Mr. Bowness, in seconding the motion, expressed pleasure that the competition feared from electricity had not done very much harm to the consumption of gas. They need not, he thought, fear the extension of either department, but should push them both as hard as they could one against the other. He thought that there would be no loss to the Corporation on either side. The minutes were confirmed.

PROGRESS OF THE HEYWOOD CORPORATION GAS AND WATER WORKS.

Statistical Comparisons.

Responding to the toast of "The Health of the Corporation of Heywood," at a recent dinner, the Mayor (Mr. Alderman Healey) made some interesting comparisons between the positions of the Gas and Water Departments in 1884 and the past year—this being the period of his service as a member of the Town Council. The figures relating to the Gas Department displayed marked progress in the twelve years. In 1884 the price of gas was 3s. 9d. per 1000 cubic feet net; now it is only 3s.—being a decrease of 9d. The consumption of gas in the past year was 100,322,737 cubic feet; while in 1884 it was 56,374,467 cubic feet—showing an increase of 43,948,270 feet, which is equal to 78 per cent. Notwithstanding the reduction in the price of gas, the profit last year was £6124, as against £4893 in 1884. In consequence of the growth of the concern, the capital expenditure has been rather high; yet compared with that of 1884, the capital per 1000 cubic feet of gas sold for last year was equal to 15s. 8d., as against £1 4s. 6d. for 1884. His lordship said it was pleasing and instructive to note that, previous to 1884, there was no transfer of gas profits in aid of the rates, but since that time £3184 had been appropriated, and £5057 had been transferred to the reserve fund. The curtailment of capital expenditure had for many years past received the serious consideration of the Committee; and since 1884 £11,635 had been transferred from revenue to that account. He thought that, if the works continued under their present management, there would be still more satisfactory results in the future. Of the water undertaking (although it is not yet a profit-producing concern) the Mayor had also a good account to present. He said they had paid more than £40,000 out of the rates for water-works losses up to the present time; and this had been a great burden on the ratepayers. However, the revenue was rapidly increasing; the annual loss was now almost extinguished; and now there remained only the sinking fund to be provided for. The water supply was second to none in the country for purity; and they possessed more than 300 acres of gathering-ground for their supply. They had a population of 60,000 persons in the water-supply area, nearly all of whom were supplied. During the last two years, about ten miles of new mains had been laid in Heywood, Middleton, Norden, and Chadderton—largely in consequence of the severe frost of two years ago. The drought of this year had tested their resources; and had they not had the Clay Lane and Middle reservoirs—new works completely and successfully carried out—they would have been in dire distress, and would have had a water famine for nearly two months. They were now proposing to enlarge the top reservoir; and the Engineer had been instructed to arrange a scheme, and prepare plans for the consideration of the Water Committee. The number of consumers in 1896 was 12,587; but in 1884, they had 11,261 consumers—an increase of 1326. The receipts for water in 1896 were £18,015. In 1885 (when increased charges were made for water), the receipts were £13,654; and thus at the present time they had an increase of £4361, or equal to 32 per cent. His lordship considered this very satisfactory, seeing that it pointed to a time in the immediate future when the water-works would be a profitable concern.

North Tawton Water Supply.—The report of Lieut.-Col. W. Langton Cook upon his inquiry into an application by the Okehampton Rural District Council for a loan of £2500 for carrying out a water supply scheme for North Tawton, and purchasing the existing small works (see *ante*, p. 560) has been under the consideration of the Local Government Board; and they have informed the Council that they will not be prepared to sanction the borrowing of the money without information as to the additional supply which can be obtained under the scheme, and the source from which it is to be derived. The Borough Surveyor of Okehampton (Mr. Harty Geen) has been instructed to take gaugings, &c., and to report fully to the Board on the subject.

SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards sold, by auction, stock and shares in several important gas companies. The first lots submitted were 200 £10 "E" preference shares (5 per cent.) in the Aldershot Gas and Water Company. Special interest attached to this parcel, as it was a new issue of shares by order of the Directors; and investors showed their appreciation of it by purchasing it all at the rate of £13 17s. 6d. per share. The next lots consisted of some original £10 shares (fully paid) in the Grays Gas Company, Limited, ranking for a maximum dividend of 10 per cent.; the last dividend having been at the rate of 8 per cent. These went for £20 10s. and £20 15s. each, with the dividend accruing from July 1. A number of 7 per cent. "B" shares (£10), the last dividend on which was at the rate of £5 12s. per cent. per annum, were practically all sold at £14 5s. per share—a few being purchased at 2s. 6d. per share less. A new issue of the Worthing Gas Company's £10 shares, by order of the Directors, carrying 7 per cent. dividend from Jan. 1, 1897, was placed at £17 and £17 2s. 6d. per share. Some fully-paid ordinary £10 shares in the Crays Gas Company, ranking for a standard dividend of 10 per cent. per annum, but, under the sliding-scale, entitling the holders to 11½ per cent. if earned, fetched £26 each; some new ordinary 7 per cent. shares, entitling the holder to 8¾ per cent. if earned, realized £18 5s. apiece. Some ordinary 5 per cent. stock of the Crystal Palace District Gas Company (last dividend 5¼ per cent.) was sold at £138 per £100 of stock. A few £10 original "A" shares in the Harrow and Stanmore Gas Company, the last dividend on which was at the rate of 7½ per cent. per annum, were knocked down at £18 each; some "B" shares of the same nominal value, earning 7 per cent., at £17 10s.; and some "C" shares, earning 5¼ per cent., at £13—the purchaser in each case taking the dividend accruing from July 1. Some "B" stock of the Croydon Commercial Gas Company, ranking for a standard dividend of 7 per cent. per annum, subject to the sliding-scale (last dividend 11 per cent. per annum), was sold at the rate of £264 per cent., with the dividend accruing from July 1.

On the following day, at the Mart, Messrs. Fox and Bousfield sold by auction a number of parts of freehold shares in the Adventurers' and Kings' moieties of the New River Company. Two 75th parts of an Adventurer's share realized £3340; a 120th part of a similar share, £1010; three 120th parts of a King's share, £2970; and a 150th part of a similar share, £770. At Norwich, on the same day, five £25 shares in the British Gaslight Company realized £55 each. Recently a number of £10 shares in the Ashford Gas Company have changed hands at an average of £20 5s. per share; and £5 shares at an average of £9 each. An important sale of new shares in the Farnworth and Kearsley Gas Company took place last Wednesday in the first-named town. There were 500 new ordinary "D" shares (7 per cent.) offered of the nominal value of £10 each, in 50 lots, each containing ten shares. The prices realized ranged from £176 to £184 per lot; the total amount obtained being £8872—giving an average of £177 10s. per lot.

THE RECENT SERIOUS GAS EXPLOSIONS AT SOUTHBANK.

A paragraph appeared last week (p. 1033) briefly recording a series of explosions that occurred on the 17th ult. at Southbank, by which, though happily no loss of life has occurred, several serious personal injuries were suffered. Since the accident, Mr. Herman Harkewitz, now of Keswick, but formerly Managing Director and Secretary of the Southbank and Normanby Gas Company for the first 15 years of its existence, has written a long letter to the "North Eastern Daily Gazette." He says it is 30 years this last summer since the works were erected under his supervision; and the mains in question were laid under his direction. It had been stated that the ground was "made ground," which, however, was not so. He was resident in the neighbourhood before any houses were built; and he did not remember a single space of ground that was raised artificially. The foundation all through was thoroughly good sound clay; but the street where the explosion occurred, and all the other streets running north and south, were made of broken slag of a considerable thickness, and the sods were previously taken off to help to fill up and raise the building sites. When in the summer of 1866 the gas-mains were laid under his direction the men had considerable difficulty to get the slag out, so as to form a trench for the pipes. Now, it is a well-known fact to chemists and gas engineers (he continues) that gas-mains laid in scoria or slag deteriorate considerably quicker than when laid in clay; and, as the life of a gas-main is only supposed to be 50 years when laid in good, sound clay, it stands to reason that these pipes, that have been laid in scoria or slag for the last 30 years, must be honeycombed through by the action of sulphur from the slag. It is his opinion that the explosion that has been recorded is not the only one that is likely to take place; and he firmly believes that numbers of the streets are in the same dangerous condition, and that unless some of the mains have been renewed since he resigned the appointment he held, or are to be immediately renewed, the danger to life and property may be fearful. He does not believe that the action of the steam-roller had anything whatever to do with the explosion. At the present time some thousands of steam-rollers are used all over England, Scotland, Ireland, and Wales, and as his present business brings him in contact with hundreds of local authorities, he can speak from experience, that during the last 15 years he does not remember a single case where a steam-roller has caused an accident of this character. In fact, from the description given by one of our contemporaries "the children for some time past have amused themselves by holding lighted matches to the ground, and igniting the gas which was rising from the ground," which is a plain fact that the leakage was there before the steam-roller went over.

A representative of our contemporary has visited the locality, with a view to making some inquiries respecting the statements in the letter. From the information he received, it is evident that Mr. Harkewitz has not exaggerated in his description of the state of affairs. It appears that several of the streets in Southbank, including the street in which the explosion occurred and the neighbouring streets on either

side, were built up with lumps of broken slag to a considerable depth. In this the gas-mains, which comprise cast-iron pipes 2-inch, 3-inch, and 4-inch diameter, were laid. The average life of gas-main of this nature, even in good clay ground, is not more than 30 years, and is frequently stated to be only between 15 and 30 years; while in ground such as this, where they would be subjected to the corroding influence of the sulphur, their duration would be much shorter. When it is remembered that these pipes have been in the ground since 1866, it will be seen that they must be in a very dangerous and leaky condition. In fact, it has been pretty generally known that there have been escapes of gas in the vicinity lately. The pipes being embedded in slag, the gas found easy passage for considerable distances; and not only have flames been lit at the surface of the ground, but only three days before the explosion, a flame was lit at a sewer manhole, the gas having found its way into the sewer. After the explosion, Mr. Nixon, the Manager of the Gas Company, had the supply to several streets cut off, while the pipes were carefully tested. In one street the mains were found in good condition; and the supply was again turned on, but in the other streets they were found to be leaky and corroded, and these streets are still in darkness. In one street, too, where the steam-roller had been at work, one of the pipes had been fractured, which is perhaps hardly to be wondered at, seeing that they are not more than a foot below the surface of the road.

ELECTRIC LIGHTING NOTES.

The hearing of a somewhat novel action has been commenced in the Southern Divisional Police Court, Dublin. It has been brought by Messrs. Oetzman and Co., Limited, against the Dublin Corporation, who, according to the summons, have made default in supplying electrical energy to the complainants, who are occupiers of premises at 61, Grafton Street. The penalty for such default, it was stated, is £2 a day; and it was alleged that the default has extended over a period of 200 days. The reception of the summons was objected to at the outset by Counsel for the defendants (Mr. Macinerney, Q.C.), unless the date of the alleged neglect was put in. Mr. Day, for the complainants, expressed his willingness to have the summons amended by inserting Dec. 31, 1895, as the date. He proceeded to read section 18 of the Corporation Electric Lighting Act, from which it appeared that they were bound to maintain the mains laid down in the streets mentioned in the second schedule appended thereto, of which Grafton Street was one. He submitted, on the reading of this and other sections in the Act, that the inhabitants of the streets in this schedule had the first claim on the energy supplied. Section 24 provided that, whenever the undertakers made default in the supply of current to those to whom they might be required to furnish it under the Order, they would be liable to a penalty of 40s. for each default. The complainants had given the requisite notice to the Corporation that they required a supply. The Corporation accepted the notice, and promised repeatedly to supply; but up to the present they had not done so. Counsel read correspondence that had passed between complainants and the Corporation, commencing on Jan. 11, 1895, on the subject of the failure to supply. As far back as Jan. 12 this year, the Town Clerk informed Messrs. Oetzman that there were 52 applications prior to theirs, and that consequently there must be some little delay before the supply could be given to them. Then, after further correspondence, the firm were told, on Feb. 7, that the new connections were being made as fast as possible, and the Corporation hoped to allow them to have the supply "within a fortnight." Nothing having been done, on Aug. 4 the complainants again wrote, strongly protesting against their treatment by the defendants, as it was then some twenty months since the first application was made. The Corporation replied, and asked for the kind indulgence of the complainants for some time longer; pointing out that they were placed in a difficulty owing to the non-delivery of a new engine. This explanation was considered unsatisfactory by Messrs. Oetzman. On Aug. 29 the Corporation offered to supply 52 lights; but the complainants refused to take any number less than 75. However, at a later date—Oct. 7—they wrote saying they would accept the 52 lights at once, and the balance later on; but they did not succeed in getting them. (Because, interposed Mr. Macinerney, the Corporation had in the meantime given them to someone else.) On concluding the reading of the correspondence, Mr. Day said the complainants had come to the conclusion that the Corporation were merely trifling with them; and so they had brought them before the Court, claiming compensation for loss that had been caused to them in their business. It was owing to the fact that the Corporation had extended their operations beyond the limited area specified in the schedule, and which was to have been a first charge on the energy, that they were left without the supply for their establishment. Mr. Macinerney submitted that a penalty could not be recovered in this case. The Corporation, he said, would supply the current to Messrs. Oetzman on the following Wednesday in the ordinary way, altogether regardless of these proceedings. The notice that had been served by complainants was not a compliance with the section, and under it the penalties applied for could not be recovered. After further argument, it was agreed to allow the case to stand over for a week; Mr. Macinerney intimating that, when the action again came before the Court, he should ask that it be dismissed.

Among certain "improvement schemes" which the Morecambe District Council have in view is the provision of an electrical supply, for which purpose they propose to purchase some of the plant of the old Company. They have asked the Local Government Board to permit them to borrow £26,000 for this particular "improvement;" and the application has engaged the attention of Colonel J. Ord Hasted at a local inquiry. He was first called upon by the Clerk (Mr. W. Tilley) to listen to the story of the unhappy career of the old Electric Light Company, whose works (which were situated in the centre of the town) were very offensive to the dwellers in the neighbourhood, and legal proceedings resulted in a conviction against the Company. The portion of their plant which the Corporation now propose to purchase for £3897 originally cost the Company above £9000. Profiting by the experience of the Company, the Corporation have selected an open site; but objection was raised to this on two grounds—first, that the works would depreciate the value of the surrounding land for building purposes, and, secondly, that the land is low-lying and subject to floods. However, the suitability, or otherwise, of the site is a point the Inspector will no doubt be able to settle, as he took the opportunity of visiting it before quitting the town.

At last Wednesday's meeting of the St. Pancras Vestry, Mr. Higgs complained of the defective electric lighting in Park Street recently. His own shop had, he said, on two occasions during the past week been without any light at all. Mr. Cox, the Chairman of the Electric Lighting Committee, stated that, as the powers to improve the system of lighting had only at the last meeting been granted to the Committee, there had not yet been sufficient time to do much in the matter; but he hoped existing deficiencies would be remedied before long, and a great improvement manifested all round. The mulcted ratepayers doubtless share in that pious wish. The Vestry subsequently agreed to compensate the wife of a ratepayer for injuries caused by falling into a trench opened for the purpose of laying electric mains. It would appear (says the correspondent who reports this) that "money *and* your life" is to be the ultimate demand on the St. Pancras ratepayers, who are sometimes blown up by explosions, and at others prematurely interred in unprotected excavations.

On the evening of the 20th ult., there was a partial failure of the electric light at Bolton. Being Friday, much inconvenience and unpleasantness were experienced in those business premises where the gas supply had not been retained. The affair (says a local paper) caused much public comment; and there were many demands for explanations, which were met by the reply that all would be "right in a few minutes."

BIRMINGHAM CORPORATION WATER SUPPLY.

An Interesting Report.

At to-day's Meeting of the Birmingham City Council, the Water Committee will present a report which deals with several important matters.

The question of lowering and relaying the mains has been before the Committee since the severe frost of 1895; and they state that they determined to relay, at a minimum depth of 3 feet, all mains which burst in 1895, and which had also burst in previous winters. They have, moreover, in several cases laid additional lengths of main for the purpose of giving inter-connections, and thus promoting the circulation of the water, and have provided special protection to all pipes passing over bridges which were cracked by the frost. The cost, exclusive of the additional lengths for promoting circulation, which are charged to capital account, is £2347, the whole of which has been charged to revenue account. All new mains will in future be laid at a minimum depth of 3 feet from the ground level to the top of the sockets. The laying of additional leading mains in the middle and low-level districts, to improve the supply in the neighbourhoods through which these mains will pass, has now been completed, at a cost of £2305.

Regarding the drought of the past summer, the Committee remark that the draught on the storage at Shustoke was very severe; the reservoir at the time when the drought broke, in August, having been drawn to an unprecedentedly low level, so much so that the condition of the supply caused the greatest anxiety in the department. Naturally, during the drought the yield of the Rivers Bourne and Blythe was very much reduced; and, although the whole yield was at that time taken into distribution after filtration, the draught on the storage continued. As regards the River Bourne, the Shustoke reservoirs provide the means of taking the yield of the river at all suitable times. The waters of the Blythe cannot, however, be stored to any considerable extent; and in view of the experience of the summer, the Committee have resolved to provide further means of utilizing the waters of the Blythe for immediate distribution whenever the state of the river is suitable for giving larger supplies than can be taken at present—thus enabling the storage of the Bourne at Shustoke to be conserved more than can now be done. In order to carry out this proposal, the Committee have entered into a contract for the purchase of a new steam-pump at £325, to be erected forthwith.

In pursuance of the instructions of the Council, the Committee have carried out an arrangement for the acquisition of the pumping rights at the Perry Sinking, Perry Barr, from the Hon. Somerset Calthorpe. Possession has been obtained of the sinking and of the land required for the establishment of a pumping-station. The trial period of one year has been extended to eighteen months; the shorter time being expected to be too short for the erection of the plant and the testing of the quantity of water. A contract has been entered into for a pumping-engine, at the price of £2050.

The Committee next propose an increase in the salary of Mr. Lees, the Secretary of the Department, from £600 to £800; and they then proceed to deal with the engineering supervision of the works. After reporting the death of Mr. J. W. Gray, which occurred on Aug. 14, the Committee remark that subsequent to the retirement of Mr. Gray, they recommended an arrangement, which was approved by the Council, under which Mr. Henry Davey, of Westminster, was engaged as Consulting Engineer, at a salary of £200 per annum, with payment of expenses and 5 per cent. commission on construction work. Mr. T. Raynes and Mr. W. Gray were appointed as Distribution Engineers, at salaries of £300 and £250 respectively; the whole of the operations of the department being under the supervision of Mr. Lees, as the chief ocal officer. In August of this year, Mr. Raynes, having been appointed Engineer to the Johannesburg Water Company, resigned his appointment under the Corporation; and the Committee have had under serious consideration the arrangements to be made in consequence of his retirement. After conference with Mr. Davey, they received a proposal from him to this effect: (1) That he should take the entire engineering responsibility of the department (exclusive of the Elan supply works, which are in the hands of Mr. Mansergh), and provide the assistance necessary to enable him to supervise the whole of the engineering operations, including alterations and new works. (2) For these services he asked a salary of £600 per annum, to include the commission

now being paid to him for new works. (3) With reference to new works already entered upon, the whole of the designing has been completed, and the construction of the principal work is well advanced. Mr. Davey is willing that, if the above proposals are carried into effect to commute the commission on works (on which he is entitled under present arrangements to a commission of 5 per cent.) to 2½ per cent., and to complete such works as part of his duties under the new arrangement. The Committee have come to the conclusion that the interests of the department will be best served by the arrangement suggested by Mr. Davey being entered into. In arriving at this decision, they have been largely influenced by the fact that any arrangement come to at the present time, must, in the nature of things, be of a temporary character, owing to the fact that the present mode of supply by pumping will in a very few years be superseded by the Elan gravitation works; and an engineer of experience in both methods of supply could only be secured at a salary far higher than that paid to Mr. Raynes. The laying and repairing of mains and other engineering matters outside the pumping-stations will remain as at present, under the immediate charge of Mr. W. Gray; and as he will now be the only engineer permanently stationed in Birmingham, the Committee propose that his salary be raised from £250 to £300 a year.

The Committee report at length upon a proposal by Mr. Murray, a member of the Council, to measure domestic supplies in a given area, and to compare it with the revenue at present derived. They point out that no distinct area can be separated for this comparison; but, taking the whole water area, a comparison may readily be made of the income of the department derived from measured supplies with the income derived from unmeasured supplies—the point of comparison to be the income per unit of water, say 1000 gallons. In the quarter ended March 31, 983·455 million gallons sold by measure yielded a revenue of £48,979—that is an average rental of 11·95d. per 1000 gallons. The balance distributed (4811·014 million gallons), representing unmeasured trade supplies and domestic supplies, produced a revenue of £138,579; being at the rate of 6·91d. per 1000 gallons. Eliminating, however, from "unmeasured supplies," all water for which no charge can be made—such as water for departmental uses, burst mains, &c.—the present revenue from unmeasured trade and domestic supplies capable of charge is approximated at the rate of 9·2d. per 1000 gallons. The Committee review the powers of the Corporation in relation to the granting of domestic supplies by meter, and conclude by saying that, after full consideration of all the statutory obligations of the Corporation, they are of opinion that Mr. Murray's suggestions cannot be utilized for the public advantage.

PORTSMOUTH WATER-WORKS COMPANY.

Half-Yearly Report—The Position of the Purchase Question.

The half-yearly report of the Directors of the above Company deals first with financial results of the working. It says the available balance on the profit and loss account is £20,972, from which the Directors recommend the payment of the full statutory dividends, and that £2000 be carried to the reserve fund, and £1000 to the arrears of dividend fund. This, after the usual deductions for void houses, &c., will leave a balance of about £3700 to be carried forward. In the course of the six months, 1614 yards of new street service-pipes have been laid, and 350 additional premises have been connected. The total number of houses, &c., connected in the borough and districts of supply is now 36,639. The average daily supply of water during the half year for all purposes has been 6,970,000 gallons. The number of fire hydrants fixed and maintained by the Company in the various districts is now 2910. Mention is next made of the Act of Parliament the Company promoted last session, and which received the Royal Assent on July 20. The Directors are purchasing certain lands, the acquisition of which was authorized by the Act; and they have accepted a tender for the execution of works in connection with the diversion of the Hermitage stream. These works are in active progress. Dealing next with the question of the acquisition of the works by the Corporation, the Directors say: "It will be remembered that, in the report of the Directors of May 11 last, it was mentioned that they were obtaining eminent professional advice on the subject of the desire of the Town Council to purchase the Company's undertaking, and that, when this advice had been received, they purposed calling a special general meeting of the shareholders, and submitting to them a provisional offer which had been made by the Council. Since then, however, the Council have apparently ascertained that there would be difficulties in their extending the repayment of such loans as they might contract for the above purpose over the period which they desired. It seems that it is not improbable that they may promote a Bill in Parliament for the removal of these difficulties. It will be the duty of the Directors to carefully watch the provisions and progress of the Bill; but as since the last report the Directors have received no communication from the Council relative to the subject, the Directors have not deemed it either necessary or desirable to call the shareholders together to consider the matter in special meeting." Attention is called in the concluding part of the report to the useless waste of water, owing mainly to imperfect fittings.

East Stonehouse Water Supply.—An inquiry was held by Colonel J. T. Marsh and Mr. E. P. Burd at East Stonehouse a short time ago, respecting an application by the District Council for a Provisional Order varying certain powers granted by the Water Act of 1893, and to enable the Council to borrow more money for purposes of water supply. With regard to the first object, it was stated that the Council wished to apply to the relief of current burdens, instead of to the repayment of capital only, the proceeds of the sale of the two reservoirs at Pounds, and also of the land constituting the leat from the reservoir to the town. The additional capital is required for the laying of a 9-inch main from the Hartley reservoir of the Plymouth Corporation to the reservoir at Pounds. By 1898, the District Council will have acquired the Stonehouse porion of the Devonport Water Company's undertaking, and will become the sole authority for the supply of water in the town; and at that time Plymouth will be called upon to furnish a continuous supply to the Council. No objection was offered.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

My "Notes" this week possess a peculiar interest, inasmuch as the writing of them was begun on the top of the fine new chimney which has just been erected in the Edinburgh Gas-Works. I was one of the few who were privileged yesterday to ascend the new column—the ascent and descent being accomplished in the hoist which has been used for the conveyance of the building materials to the workmen. Being on the top, the notion, which seems to be a universal weakness of humanity when they get on to a pinnacle, occurred to me to do something to commemorate the event; and nothing seemed so appropriate for such a purpose—either to myself or to the chimney—than to make that elevated spot the point from which my "Notes" to the "JOURNAL OF GAS LIGHTING" for the present week should emanate. Accordingly, I jotted down a sentence. But the situation was not the most comfortable one to write in—the clouds not making the most impervious of roofs, and the cold east wind having rather too free an access to be agreeable; and so I resolved to continue my work on a lower plane, and came down. I will return to the subject of the chimney again later on, as there is more important news to be dealt with first. I may, however, record that Mr. R. Mitchell, the Engineer and Manager of the works, and the designer of the chimney, has prepared a neat account of it, which, in lithographed form, was distributed among the guests whom the Gas Commissioners had invited to attend the ceremony of formally completing the structure.

The most important information I have to communicate this week is the fact that the award in the Dunfermline Gas Arbitration has been issued to-day. The hearing of evidence took place in Edinburgh, on Oct. 9, 10, 12, 13, and 14; and Counsel were heard on the evidence on Oct. 24. It has thus taken the Court more than a month to make up their mind as to the amount which they would award as the value of the Dunfermline Gas Company's undertaking. It was anticipated by many, I may say, that there would be a stiff controversy between Mr. W. Foulis and Mr. H. E. Jones, the Arbiters; both being men of much strength of mind, and having great latitude of figures presented to them by the witnesses, upon which to work. It was thus fully expected that the Oversman (Mr. J. Shiress Will, Q.C.) would require to be called in to give the decision. This is, roughly, what has happened. The Arbiters held their final meeting in London last Saturday, and came to certain agreements. They then called in the Oversman upon points on which they could not agree; and the decision was not long in being given. It was placed in the hands of Mr. W. Reid, Solicitor, of Dunfermline, the clerk to the reference, this forenoon; and it is now public property. The amount awarded as the value of the undertaking is £80,000. In addition, the Corporation pay £11,900 of mortgage debts of the Company, and £2245 for stocks in hand and outstanding accounts at May 31 last—making altogether £94,145. Interest is allowed on this sum from May 31 till payment. The interest will amount to £1880, or a little more; and thus the total price which the Corporation will pay will be a little over £96,000. The costs of the transfer are, of course, borne by the Corporation. These will amount to more than £5000; and the total outlay upon the purchase of the Company's undertaking will thus be over £100,000. Deducting the £11,900 of mortgage debt, the sum which the shareholders of the Company will have for distribution, *minus* a few trifling expenses, will be a little over £84,000 of Corporation money. But they had also £5340 of cash in hand, which is not dealt with in the award; and I presume the Company will keep it. They would then have a sum of £89,000 to divide.

As to the reasons which underlie the decision given, we are not yet enlightened; and if precedent be followed here, we never shall be. I am sure, however, that few who are gas publicists will consider that the award errs on the side of giving too much. I myself expected £100,000 clear, and the mortgages over. It is a well-known principle in determining such questions that those who are bought out shall get as much as will enable them to earn a like return from other investments. Now, to take the figure of Mr. Colson, that Gaslight and Coke Company's stock is yielding 4 per cent.—a little over, I think he said—£80,000 will only return £3200, and £89,000 will only yield £3460. Last year the profit of the Company was £5164. To earn this, would have required an award of about £130,000. An allowance would, however, be required in respect of the inflation of the Company's claim, which was to be expected; and in this view, an average of the profits for the past few years would be a fair standard to go by. These, I think, work out at about £3500. It would therefore seem to follow that the Corporation should have paid a price which, on the figure of their own witness, should have yielded at least £3500 a year. A little more would be desirable, because of prospective increase of business, and the capacity of the works to meet it, both of which ought to be taken into account. Therefore I look upon £100,000, which would at 4 per cent. produce £4000 a year, as the natural price. The Arbiters seem to have taken into account some very mitigating circumstances, before they gave so low a price. This could only be, for the sole arguments urged on behalf of the Corporation were the improbability of the town extending, and the probability of the advance of electric lighting. Well, as to the application of these arguments, there is a very decided limit reached before one proceeds far. It is this, that if either, or both, of these drawbacks were believed to attend the future of gas in Dunfermline, the Corporation should not have sought to purchase. Any conceivable hindrance to the gas consumption in Dunfermline in the future could only be problematical; and it is not only unfair, but it is unjust that the shareholders of the Company should have to bear a burden which has not yet, and may never, come upon the gas supply. The probability is strong that the gas consumption will go on increasing; and thus the Corporation will get the benefit of any allowance on the ground of bad prospects. There is an item which may have influenced the Arbiters in fixing a small price—the low illuminating power of the gas supplied. But on this the remark may be made that, considering Mr. Foulis was the Company's nominee, and that only in Glasgow and Dunfermline is such low-grade gas supplied, it is not likely he would have used this as an argument for reducing the value of the undertaking. If the quality of the

gas was taken into account, the incident may be a warning to all who have gas undertakings to look after, not to tamper with the illuminating power.

There was a consideration which I looked upon as germane to the question of value, but which was not put forward. It occurred to me when Mr. Shaw was endeavouring to make so much out of Mr. MacPherson, of Kirkcaldy, on the subject of the great difference between the price of gas charged by him with that charged in Dunfermline, and it was this: That Dunfermline is one of the few towns in Scotland which have not the benefit of competition in the matter of carriage, either by land or sea. Railway rates to Dunfermline, and to a few other places—such as Cupar, Hawick, Galashiels, Haddington, and Peebles—must be relatively higher than to other towns; and every little in this respect tells upon the price of gas. That is a consideration which ought to have gone to the benefit of the Company, because the Corporation have it in their power to make an effort to do away with a railway monopoly, and thus secure cheaper carriage rates.

As to the arbitration generally, though I hold the belief that the price which has been awarded is too low, I feel constrained to say that everything connected with it was conducted in the best of feeling. The proceedings were leisurely gone about. There were no disputes, and no litigations; but there was a constant interchange of courtesy and cordiality, which it was pleasant to witness. As contributing largely to this state of matters, I must say, in justice to that gentleman, that no one could have been a more careful, painstaking, and efficient clerk than was Mr. Reid. Readers of the "JOURNAL" owe much to him, because, except for his great consideration for the representatives of the Press, they would not have had so full an account of the proceedings in the arbitration presented to them.

I cannot leave the subject without remarking how sorry I was to see so little that was Scotch in the arbitration. The only technical evidence which was led by a Scotchman was by Mr. MacPherson, of Kirkcaldy; and the only other technical gentleman in the arbitration was Mr. Foulis, the Arbiter nominated by the Company. Mr. A. Smith, of Aberdeen, was retained as a witness for the Corporation; but they did not call him. The works at Dunfermline were erected to plans by a gentleman whose experience has been gained in England; they are managed by one who was trained in England; they have been worked upon a method which is more English than Scotch; and they have been taken over upon evidence which was four-fifths English and one-fifth Scotch. I do not complain of any of these matters; nor do I hint that any of the parties have either gained or lost by the arrangements. But I do say that there are managers in Scotland who are as capable of giving evidence in gas transfers as anyone; and it is a pity not to see them employed. I put the question in this column several months ago, whether Scotland stood where it did. I now repeat this question; and I would beg to add that, if there be any falling off, I am satisfied it is not in ability, but in want of energy or push—a matter which is easily remedied. I would suggest that at next year's meeting of the North British Association of Gas Managers, someone should take up the subject of the valuation of gas-works, and read such a treatise upon it as would compel attention, and might be productive of much good. It may be that the intention of this "Note" will be mistaken, or not appreciated; and so I add that I do not write with the object of depreciating Scotchmen. Nothing is further from my mind. I simply point out that Scotchmen have allowed themselves to get out of the front line on parade. They may be as good as, or better than, some who are more prominent, but they lack the prominence; and I wish them to realize this, and come forward.

I spent a very pleasant afternoon in the University of Glasgow on Monday, on the occasion of the presentation of the Murdoch Memorial Gas-Engine to the University. As a report of the proceedings appears elsewhere in this issue of the "JOURNAL" (see p. 1081), I need to say less here. At the same time I could not help thinking that a frail gas-engine, which may be out of date in six months' time, which at present is concealed in a vault below the University building, and which, even when it is placed in its final position, will only be within the view of a very limited class, was scarcely a fitting memorial to the man who invented lighting by gas. Though not quite approving of the form of the memorial—and I daresay the Committee in charge of the Fund are not very far from my way of thinking—there was a development in the course of the presentation proceedings which was exceedingly agreeable. This was the extreme generosity displayed by the Committee, in presenting an engine which is to be used in the generation of electricity for lighting purposes. In this, I see clearly the indication that, in the view of the Committee, there is nothing to fear on the part of gas in the competition with electricity. The incident is one which cannot be too loudly proclaimed on the house-tops. A few years ago, such an arrangement as is here made, would have been looked upon as a cut-throat policy. Now it is hailed as the correct thing to assist the sister light. Such a change of feeling can only be attributed to the fact that it is at last realized that the two lights are not deadly enemies, as they were wont to be considered. I had another feeling of satisfaction in connection with the event of Monday, in that I learned from Mr. M'Gilchrist, the Secretary and Treasurer of the Fund Committee, that the fund is not exhausted; and that it is intended to present a copy of "Light without a Wick"—the short biography of William Murdoch, which was issued in 1892, and which the Committee have bought up—to every public library in Scotland. This will place the name and the doings of the great inventor before a very wide circle of the community. After that, I suppose the Committee's labours will be at an end. It has been hard work; but the Committee, having taken it up, stuck to it, and for that, and the measure of success which they have attained, they deserve to be congratulated.

To return to the Edinburgh Gas-Works chimney. The ceremony of laying the last brick was successfully performed by Lord Provost M'Donald; and the screwing of the last bolt—a nickel plated one, which attaches the lightning-rod connection to the ironwork at the top—was done by Mr. Mitchell. A few complimentary remarks were exchanged on the top; and then the company descended, and were entertained to luncheon in the workmen's dining-hall. The proceedings there were of the customary description; but it may be stated that, in the course of the speaking, it was remarked that not a single accident had occurred in connection with the erection of the chimney. The chimney is a beautiful structure—pretty in design, and built of materials which harmonize in colour. It stands about 116 feet to the north of the old one; and when on the top of it, though the old one is 71 feet higher, there is the feeling that it is only a few feet taller. With reference to the old chimney, it is at present believed to be quite steady, though about 3 feet off the perpendicular. It would, however, require to go 15 feet before it would fall. Though the new chimney has now been successfully completed in structure, there is a good deal of work to be done upon it, which will take a month or two to finish; and after that, it will require to be tested and seasoned to the high heats. The arrangement in it, by which an inner lining of fire-brick is surrounded by an air-space about 1 foot in width, ventilated bottom and top, is one which is expected to keep the chimney cool, and prevent cracking. The inner lining may require repair at some time; but the structure of the chimney, it is anticipated, will remain untouched.

Everyone will be glad to see from the proceedings at the completion of the chimney, that Mr. R. Mitchell has again resumed duty. He tells me that he went as far as Johannesburg, and had luncheon on the spot where Dr. Jameson surrendered. This is interesting; but it will be of equal interest to know that he has greatly benefited by his trip.

At a meeting of the Aberdeen Corporation Gas Committee, on Wednesday, it was resolved that the Manager (Mr. A. Smith) should go to Glasgow and see the cyanogen extracting process at work with a view to considering if the Corporation should adopt the system. They are offered 3½d. per lb. for the product.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 28.

Sulphate of Ammonia.—Throughout the week, the market has been quiet; and there has been a further decline in values, owing mainly to the offering of second-hand parcels. Covering having been done during the early part of the month, there has been very little buying on the part of dealers. Consumers, too, have for the most part held aloof, notwithstanding the temptation of easier prices—looking, as they do, for a further decline in values. There are, therefore, at the close, sellers at £7 10s. per ton f.o.b. Hull and Leith, and at £7 12s. 6d. per ton f.o.b. Liverpool, though makers generally have not made up their minds to accept these figures. In Scotland, makers have been comfortable, having contracts to go on with; and the same is to some extent true of makers in London. At other points, the remark does not apply to the same degree, though some of the larger makes are sold into December. Hence available supplies have increased during the week; and where sales have had to be made, it has been at a decline. In the forward position, makers are very firm. Speculators, however, have been again in the field; but their overtures have not been very successful—consumers everywhere being indifferent, and spot-December being much below any prices sellers venture to quote for next year.

LONDON, *Nov.* 28.

Tar Products.—This market continues dull and uninteresting. There is no improvement in pitch, nor does benzol continue to show the signs of life that have marked it for months past. The buying that is now going on in this article is largely to cover dealers' sales made at higher prices. Creosote and tar oils are moving off a little more freely; and the demand for the former is accentuated by the general improvement in trade. Solvent naphtha is reported to be scarce; and for prompt delivery, there is some inquiry for crude 30 per cent. Carbolic acid is firm; and naphthalene is in undoubted increasing demand. Some sales of "B" anthracene, outside the Committee's influence, are reported at 8d. per unit. The following quotations may be taken as the week's averages: Tar, 18s. 6d. to 26s., according to position and quality. Pitch, 26s. to 28s. 6d. Benzol, prompt, nominal, 3s. 9d.; forward, 3s. 6d.; 50's, prompt, 2s. 10½d.; forward, 2s. 6d. Solvent naphtha, 1s. 5d. to 1s. 6d. Crude, 30 per cent. naphtha, prompt, 1s. 4½d.; forward, 1s. 2d. Creosote, 1⅞d.; liquid, 2⅛d. Heavy oils, 42s. 6d. Naphthalene, 65s.; salts, 32s. 6d. Cresylic acid, 10d. Carbolic acid, 60's, 2s. Anthracene, "A," 9½d. to 10½d.; "B," 8d. to 8⅛d.

Sulphate of Ammonia is somewhat lifeless. Buyers cannot make up their minds whether the improved prices now quoted will be maintained. The recent spurt cleared away very considerable provincial stocks; and makers are more comfortable as to the immediate future. Prices are from £7 7s. 6d. northern ports; £7 10s. north-eastern ports; £7 12s. 6d. western ports; and £7 17s. 6d. London and southern shipping ports—less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There is no specially new feature to notice in the coal trade here; pits being kept going full time, with the output in most descriptions of fuel meeting with a ready sale. In better qualities of round coal, the demand during the past week has shown a slight falling off; but there is still a fairly active business being put through, with prices well maintained at the recent advance. Steam coals are also in good demand, with supplies nothing like so plentiful as they have been, and a firm tone as regards prices. At the pit mouth, best Wigan Arley averages 10s. 6d. to 11s. per ton; Pemberton four-feet and seconds Arley, 8s. 6d. to 9s.; and steam coal, 6s. 6d., with 6d. more asked in some cases. Engine fuel is rather more plentiful on the market; but except in some of the commoner sorts, local collieries are moving away their present output without much difficulty. Prices are steady at late rates. The shipping trade continues active, with ordinary steam coal fetching 7s. 9d. to 8s. 3d. per ton delivered at the Mersey ports or on the Ship Canal.

Northern Coal Trade.—The trade of this district is easier in the steam coal branch, but shows greater activity in gas coals, though the range of prices does not show many alterations. Best Northumbrian

steam coals are very dull; and many of the collieries are only working very short time. The prices are on the basis of 7s. 6d. per ton f.o.b. for best steam coals; and about 7s. 3d. for second qualities. Gas coals are now in very heavy demand; and for the next two or three weeks the shipments should be the heaviest in the year, if labour troubles do not intervene. Most of the deliveries are on old contracts at low rates; but for such quantities as are beyond these contracts, the price quoted is as high as 6s. 9d. to 7s. per ton f.o.b. Manufacturing coals are rather steadier, as a considerable portion of the output is now sold for next year. Generally the price is from the current rate to about 3d. per ton over those that have ruled this year. Gas coke is unaltered this week, either in price or production.

Scotch Coal Trade.—The demand continues to be active, at about the same prices as last week. There is an agitation among the miners in the east of Scotland for an increase of wages, with a strike threatened, which nobody expects will take place. It is likely, however, that the men will get a slight advance. The men are not so prominent in the agitation as their leaders, and are, with very few exceptions, working steadily. The quotations are: Main, 6s. 9d. per ton f.o.b. Glasgow; and ell, 7s. The shipments for the week amounted to 129,020 tons—a decrease on the preceding week of 21,139 tons, and on the corresponding week of last year of 22,466 tons. For the year to date, the total shipments have amounted to 6,946,314 tons—an increase over the same period of last year of 193,162 tons.

The Gas-Works Purchase Question at St. Anne's.—The poll of the ratepayers in St. Anne's-on-the-Sea as to whether or not the local authority shall apply to Parliament for powers to compulsorily acquire the gas-works, has been concluded. There were 262 votes for the acquisition of the works, and 231 against; while 257 voting-papers were returned blank.

Proposed Reconstruction of the Leatherhead Gas Company.—The Leatherhead Gas Company have informed the District Council that, in view of the recent notification respecting the formation of an electric lighting company, the Directors are engaged in the reconstruction of their Company, with the object of incorporating powers of lighting by electricity or any other illuminating invention.

Epsom Water-Works Extensions.—Mr. G. W. Willcocks, M.Inst. C.E., recently held an inquiry at Epsom in connection with the application of the District Council for the sanction of the Local Government Board for borrowing powers—a sum of £3000 being required for works of water supply. Mr. A. Low opposed the application so far as the water question was concerned. The original estimate for the water-works scheme was, he said, put by Mr. G. Hodson, the Consulting Engineer called in, at £14,000; and now, though no extra work had been undertaken, £3000 more was required. Mr. E. G. Wilson, the Council's Clerk, said that £2500 of the first loan was required for machinery and an engine, and £11,500 for the construction of a new reservoir and the laying of mains. It was anticipated that this sum of £14,000 would have been sufficient; but the lowest tender for the performance of the work was £2000 in excess of the estimate.

Water Supply in the Wokingham District.—In reference to the paragraph on this subject which appeared in the "JOURNAL" for July 14 last, the Local Government Board have informed the Wokingham Rural District Council that they are prepared to permit the borrowing of £1342 for works of water supply for the parish of Wargrave, but would defer sanctioning the loan required to meet the excess cost on the works for the joint benefit of the parishes of Wargrave and Twyford until the apportionment between the parishes was settled.

Explosion of a Tar-Tank at the Batley Corporation Gas Works.—An explosion, which created much consternation, occurred at a late hour last Tuesday at the Batley Corporation Gas-Works. Beneath the surface of the ground in the yard abutting on the retorts and offices was a circular stone tank, measuring 16 feet in depth by 52 feet in diameter, used for the storage of tar and ammoniacal liquor. By the gauging of a few days previous it was computed that on Tuesday night it would be about half full, and contain approximately 300 tons of tar and 300 tons of liquor. At about half-past ten o'clock, the tank exploded with a great noise, tearing up a considerable portion of the yard, and throwing tons of paving-stones and *débris* in all directions. The explosion shook the whole of the works. The Manager (Mr. Bromley), who had left the works only about an hour before the occurrence, was at once summoned; but in the darkness not much could be done with safety. Happily no one was injured; and it is estimated that the damage will not amount to more than £100. The cause of the explosion has not yet been explained.

Proposed Purchase of the Hunstanton Gas-Works.—The Urban District Council of Hunstanton are discussing the question of purchasing the local gas-works either by agreement or compulsion. The matter has been brought forward under the following circumstances: The Council had asked for a new main in Park Road, and the Company replied that the whole question of mains had been submitted to an expert, who had advised several new ones—notably one of large size from the gas-works to the corner of the Green. But as the Council had instructed their Surveyor not to allow the Company to break up the roads, they could not agree to lay the main in Park Road until general permission for the whole of the proposed mains was given. Mr. Le Strange said it was an important question with the consumers that a main of sufficient size should be laid from the works; and he asked whether the Company would do it as cheaply as the Council, should the undertaking be acquired. Mr. Hall proposed that the Council should maintain its position, and ask for the laying of the main in Park Road, and not give the required authority for breaking up the Council's roads until a reply was sent as to the terms of purchase. This was seconded and carried *nem con.* The Company made a claim for damaged mains, and loss of gas thereby caused, by the use of the Council's steam-roller; and the Clerk was directed to inquire under what authority the Company (a private concern) had laid the mains and whether the depth was sufficient to withstand ordinary traffic. In connection with this matter, it is announced that Mr. Le Strange had retired from his position as a Director of both the Hunstanton Gas and Water Companies, because he does not agree with the policy of his colleagues in refusing to negotiate for the sale of their undertaking to the Urban District Council.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 1060.)

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	23—25	..	4 4 0
100,000	10	"	7½	Do. 7 p. c.	17½—18½	..	4 1 1
300,000	100	1 July	5	Australian (Sydney) 5% Deb.	107—110	..	4 10 11
200,000	10	29 Oct.	5	Belgrano (B. Ayres), Limited	10½—11	..	4 10 11
100,000	Stck.	26 June	5	Do. 5 p. c. Deb. Stk	104—107	+2	4 13
200,000	5	12 Nov.	6½	Bombay, Limited	7⅞—8	..	4 1 3
40,000	5	"	6½	Do. New, £4 paid	5⅝—6¼	..	4 3 2
380,000	Stck.	13 Aug.	12	Brentford Consolidated	285—290	..	4 2 9
210,000	"	"	9	Do. New	215—220	..	4 1 9
50,000	"	"	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	"	12 June	4	Do. 4 p. c. Deb. Stock.	130—134	..	2 19 9
220,000	Stck.	16 Sept.	11½	Brighton & Hove Original	242—247	..	4 13 1
208,820	"	"	8½	Do. A Ord. Stk.	185—190	..	4 9 5
933,500	Stck.	28 Aug.	5	Bristol, 5 p.c. max.	127—132	..	3 15 9
420,000	20	15 Oct.	11¼	British	55½—56½	..	3 19 7
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	22—23	..	5 0 0
71,000	10	"	8½	Do. 7 p. c.	19—20	..	4 5 0
500,000	10	15 Oct.	6	Buenos Ayres (New) Limited	10¼—10⅜	—¼	5 11 8
200,000	100	1 July	6	Do. 6 p. c. Deb.	102—105	—1	5 14 3
150,000	20	15 July	8½	Cagliari, Limited	29—31	..	5 6 5
100,000	10	30 Sept.	6	Cape Town & District, Ltd.	16½—17½	..	3 8 8
50,000	50	3 Nov.	6	Do. 6 p. c. 1st Mort.	57—59	..	5 1 8
550,000	Stck.	15 Oct.	13½	Commercial Old Stock	338—343	..	3 18 8
165,000	"	"	10½	Do. New do.	255—260	..	4 0 9
165,000	"	12 June	4½	Do. 4½ p. c. Deb. do.	152—157	..	2 17 3
800,000	Stck.	12 June	13	Continental Union, Limited.	272—277	—6	4 13 0
200,000	"	"	10	Do. 7 p. c. Pref.	220—225	..	4 8 11
51,600	Stck.	28 Aug.	14	Croydon Com'cial A 10 p. c.	315—320	..	4 7 6
163,400	"	"	11	Do. B 7 p. c.	250—255	..	4 6 3
535,000	Stck.	28 Aug.	5½	Crystal Palace Ord. 5 p.c. Stk	140—143	..	3 13 5
60,000	"	"	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
486,090	10	15 July	11	European, Limited	26—27	..	4 1 6
354,060	10	"	11	Do. £7 10s. paid	18—19	..	4 6 11
5,746,590	Stck.	13 Aug	12¾	Gaslight & Coke, A, Ordinary	313—318	—3	4 0 2
100,000	"	"	4	Do. B, 4 p. c. max.	110—115	..	3 9 7
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	305—315	..	3 3 6
30,000	"	"	5	Do. F, 5 p. c. Prf.	147—152	..	3 5 9
60,000	"	"	7½	Do. G, 7½ p. c. do.	212—217	..	3 9 1
1,300,000	"	"	7	Do. H, 7 p. c. max.	207—212	..	3 6 0
463,000	"	"	10	Do. J, 10 p. c. Prf.	305—315	..	3 3 6
476,000	"	"	6	Do. K, 6 p. c. Prf.	172—177	..	3 7 10
1,061,150	"	12 June	4	Do. 4 p. c. Deb. Stk.	138—143	..	2 15 11
294,850	"	"	4½	Do. 4½ p. c. do.	150—155	..	2 18 0
908,000	"	"	6	Do. 6 p. c. do.	205—210	—2	2 17 1
70,000	10	29 Oct.	6	Hongkong & China, Limited	12—13	..	4 12 4
3,800,000	Stck.	12 Nov.	12	Imperial Continental	220—225	—2	5 6 8
376,400	100	1 Aug.	4	Do. 4 p. c. Debs. Red.	100—.03	..	3 17 8
473,600	Stck.	13 Aug.	3½	Do. 3½ p. c. Deb. Stk	108—110	..	3 3 8
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	6—6½	..	4 12 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	111—115	+2	4 6 11
250,000	100	"	4½	Do. 4½ p. c. Debs.	108—110	..	4 1 10
511,920	20	12 Nov.	5	Monte Video, Limited	16—17	..	5 17 8
150,000	5	26 Nov.	8	Oriental, Limited	8½—9*	..	4 8 11
135,000	5	"	8	Do. New, £4 10s. paid	7½—8*	..	4 10 0
15,000	5	"	8	Do. do. 1879, £1 paid	1½—2*	..	4 0 0
60,000	5	16 Sept.	7	Ottoman, Limited	5—5½	..	6 7 3
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds.	102—107	..	5 12 1
500,000	100	1 June	6	of Chicago } 2nd Do.	102—107	..	5 12 1
250,000	10	30 Sept.	10	San Paulo, Limited	13—14	..	7 2 10
5,475,000	Stck.	13 Aug.	5½	South Metrop., 4 p.c. Ord.	144—148	..	3 10 3
820,000	"	15 July	5	Do. 5 p. c. Deb. Stk.	171—174	..	2 17 6
60,000	Stck.	16 Sept.	11½	Tottenham & Edmonton, A	270—280	..	4 2 3
60,000	"	"	8½	Do. B	180—190	..	4 9 5
170,380	10	29 May	10	Tuscan, Limited.	13¾—14½	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	101—103	..	4 17 1
				WATER COMPANIES.			
746,123	Stck.	26 June	10½	Chelsea, Ordinary	338—343	..	2 19 9
150,000	"	"	5	Do. 5 p. c. pref.	177—182	..	2 14 11
160,000	"	"	4½	Do. 4½ p. c. Pref. Stk., 1875	160—164	..	2 14 10
175,785	"	30 Sept.	4½	Do. 4½ p. c. Deb. Stock	162—167	..	2 13 11
1,719,514	Stck.	15 Oct.	7	East London, Ordinary	230—235	+8	2 19 7
554,740	"	26 June	4½	Do. 4½ p. c. Deb. Stk.	163—168	..	2 13 7
225,000	"	"	3	Do. 3 p. c. Deb. Stk.	105—107	..	2 16 1
700,000	50	12 June	7½	Grand Junction, 10 p.c. max.	117—122	+4	3 1 6
295,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150—155	..	2 11 7
708,000	Stck.	13 Aug.	12	Kent	335—345	..	3 9 7
160,000	"	"	7	Do. New, 7 p. c. max.	215—220	..	3 3 7
1,043,800	100	26 June	9½†	Lambeth, 10 p. c. max.	272—277	..	3 8 7
406,200	100	"	7½	Do. 7½ p. c. max.	225—230	..	3 5 2
350,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150—153	..	2 12 3
500,000	100	13 Aug.	12⅝	New River, New Shares	418—423	..	3 1 0
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk.	150—155	..	2 11 7
902,300	Stck.	12 June	4	S'thwk & V'xhall, Ordinary	152—157	—2	2 11 0
126,500	100	"	4	Do. Do. 7½ p. c. Max.	148—153	..	2 12 3
489,200	Stck.	"	5	Do. Do. 5 p. c. Pref.	175—180	..	2 15 6
1,019,585	"	30 Sept.	4	Do. 4 p. c. A Deb. Stk.	148—152	..	2 12 7
1,155,066	Stck.	12 June	10	West Middlesex	317—322	—1	3 2 2
200,000	"	"	4½	Do. 4½ p. c. Deb. Stk.	165—170	..	2 12 11

† Next dividend will be at this rate. *Ex div.

The General Gas Company of France.—The report of this Company for the twelve months ending June 30 shows that the result of the working in that period was a total of 2,848,176 frs., as compared with 3,563,329 frs. in the year closing in June, 1895. This is an apparent decrease; but when it is remembered that the last-named sum included 778,943 frs. profit on the sale of shares in the Austrian Gas Company, which should not strictly be regarded as working profits, the figures for 1895 are reduced to 2,784,386 frs., showing an actual increase this year of 63,790 frs. Deducting the general expenses, 5 per cent. on the share capital, the amount required to pay interest on the bonds, the Directors' fees, and other charges, there was left, with the balance brought forward (183,501 frs.), a sum of 740,017 frs., of which 300,000 frs. were distributed among the shareholders, 150,000 frs were added to the contingency fund, and the balance of 290,017 frs. was carried forward. The dividend was 32 frs. 50 c. per share (500 frs.). The general condition of the undertaking may be regarded as satisfactory, in view of the competition of electricity and the increased use of economic gas-burners.

The Threatened Strike of Rotherham Gas Workers.—It will be remembered that nearly three weeks ago between 40 and 50 of the stokers employed at the Rotherham Corporation Gas-Works handed in their notices. They complained that the work is too laborious, and desired that regular coal wheelers should be employed, or that the stokers should be granted an advance of wages. Further, they wished for the re-instatement of a man who had been dismissed without notice. The matter has been considered by the Gas Committee, who have appointed a Sub-Committee, consisting of the Mayor (Alderman G. Neill), Mr. G. Gummer (Chairman of the Committee), and Mr. G. H. Copley (one of the Labour members of the Council), to deal with the question. The notices should have expired last Thursday; but on Tuesday a number of the men had an interview with the Sub-Committee, the Secretary (Mr. Bellamy), and the Manager (Mr. Murdoch). The points in dispute were fully discussed; and it was agreed that the Sub-Committee should make further inquiries, and to enable them to do so, the notices should be postponed for a week. It is expected that an amicable arrangement will be arrived at.

Caerphilly Gas and Water Schemes.—A statutory meeting of the owners and occupiers in the area of the Caerphilly District Council was held yesterday week to consider the proposed application to Parliament for power to construct reservoirs and to acquire from the Caerphilly Gas and Water Company and the Taff's Well Gas Company their respective undertakings. The chair was occupied by Mr. E. W. M. Corbett, the Vice-Chairman of the Council, who briefly outlined the intentions of the Council. Mr. W. Thomas followed, and gave practical reasons for adopting the scheme for acquiring the watershed lying to the east of Senghenydd, where it is proposed to construct a reservoir and lay the necessary mains, at an approximate cost of £25,000 to £30,000. The reservoir would have a capacity of about 25 million gallons. He named the various streams it was proposed to acquire, and then lightly touched on the gas scheme. The Caerphilly Gas Company, he said, had a paid-up capital of £3000, and the works were situated between Caerphilly and Bedwas. The authorized capital was £7000, split up into £5 shares; and the Company had for the last two years paid a dividend of 7½ per cent. The Taff's Well works were smaller, with less capital, and a lower dividend. The resolution agreeing to the promotion of the Bill was carried unanimously.

Torquay Water Supply.—The prospects of a renewal of opposition to the proposals of the Torquay Corporation respecting the water supply are being discussed in the town. On the whole, it is thought that the agitation, if any, will be less strong than it was three years ago, when it was successful in defeating the Corporation scheme. For one thing, many people have come to the conclusion that the reputation of the town was damaged by the doubts so freely expressed by local residents respecting the purity and sufficiency of the supply. Those who hold this opinion are likely now to stand aloof from any movement calculated to again raise a discussion on the subject. Another section of the opposition will be disarmed by the change which the Corporation have made in their plans. Formerly, the object was to acquire the land surrounding the Tottiford and Kenwick reservoirs only; and it was argued by the opponents that this was but a partial scheme, which would leave the purity of the water supplied from the adjoining Trenchford Valley still open to question, and which made no provision for the necessary extension of the storage. In their proposed Bill for next session, the Corporation will seek the wider powers urged upon them three years ago; and it is believed the consent of the ratepayers will be obtained to the scheme.

A New Water Scheme for Uxbridge.—Mr. James Mansergh has reported to the Uxbridge District Council on the present and future water supply of the district. He advises them to search for additional water away from the present works, because, first, he is not satisfied they could there obtain the quantity they require, and, secondly, the works are in the middle of the town, where, from one cause or another, pollution of the water may take place. He suggests that a well and headings should be put down a little way up the valley of the Colne above the town; but, before being absolutely committed, he recommends that a trial boring should be made. If the Council succeed in getting an ample supply, it might, Mr. Mansergh thinks, be desirable in the future to abandon the existing works; and with this in view, he has provided in the estimate he has made for pumping plant in duplicate sufficient for 250,000 gallons a day. His calculations as to the cost of the works, exclusive of land and easements, are: Trial boring, £150; well, 8 feet in diameter, lined with iron cylinders, 100 feet deep, with 200 feet of headings in the chalk, £2000; pumps and engines of 12½-pump horse power, capable of raising 250,000 gallons in 24 hours into the reservoir and tank, in duplicate, £3000; 7-inch rising-main from the well to reservoir and tank on the east side of Frays river, £1200; tower, 50 feet, with tank on top holding 50,000 gallons, £2000; high-level service-mains (provisional estimate), £500; contingencies &c., £1150—total £10,000. Concluding his report, Mr. Mansergh urges the Council to do something safe both in regard to the quantity and quality of their supply—fearing, as he does, that any patching of the present works would only be wasted money in a few years.

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Proposed Purchase of the Kirkham Gas-Works by the Local Authority.—The Kirkham District Council have under consideration the question of acquiring the undertaking of the Gas Company. The share capital of the concern is limited to £10,000; and all has been called up and expended on plant, except about £1000. There is no loan capital; but the Company have borrowing powers to the extent of £10,000. Last year, the profits amounted to about £700; and a dividend of 7 per cent. was declared. The Company have a reserve fund of £668; and their consumers include a number who use penny-in-the-slot meters.

The Assessment of the Colchester Gas-Works.—On Thursday last, Mr. W. A. Valon, who is advising the Colchester Gas Company with respect to their assessment, with Mr. Goody, the Company's Solicitor, Mr. H. S. Pike, the Manager, and several Directors, appeared before the Assessment Committee of the Colchester Union to appeal against the increased assessment made by them on the Company's undertaking at the commencement of the year. After hearing Mr. Valon at considerable length, the Committee decided to reduce the amount of the net rateable value from £3875 to £3041. The Company were satisfied with this, and further proceedings were stayed.

Singapore Gas Company, Limited—The Directors report on the operations of the Company for the half year ended June 30 (issued last week only) says that the results of the six months' working is not so good as might have been expected, owing in a great measure to the change of managership, which involved extra expenditure, particularly for salaries and travelling expenses. Taking this into consideration, and with the knowledge of the uncertain state of exchange, and the necessity of an immediate outlay of about £900 for the erection of new retorts on an improved system, the Directors think it best to defer payment of a dividend until the final accounts for the present year are to hand. The Directors intimate that they have arranged a contract for public lighting with the Municipality of Singapore for the next two years at an increased price of about 25 per cent., which should materially benefit the Company.

Incandescent Gas Lighting Experiments at Beckenham.—The Surveyor to the Beckenham District Council has prepared a report upon his experiments in incandescent gas lighting with six Welsbach lamps during the past twelve months. The following is the net result: Saving in gas per hour per incandescent burner, 0·52 cubic foot; average life of mantles, 51 days, or 676 lighting hours; average life of mica chimneys, 137 days, or 1816 lighting hours; annual cost of mantles, chimneys, &c., per lamp, 10s. 10½d.; saving in gas per lamp, 5s. 2d.; net loss per lamp, 5s. 8½d.; annual net loss over whole district (670 lamps), £191. The capital cost of adapting the lamps of whole district to incandescent lighting: Ordinary burners, £450; burners with bulbs and metal reflectors, £550; same with special lanterns (not recommended), £1250; burners with special tap outside lantern, £530; switch spring burner, £550. The illumination would be increased 300 per cent.; and the annual cost increased 10 per cent.

The Welsh Water Scheme of the London County Council.—Sir Benjamin Baker and Mr. G. F. Deacon, M.M.Inst.C.E., the Engineers appointed by the London County Council to carry out certain investigations in connection with the Council's scheme for the supply of London with water from Wales, have completed their labours; and their report is expected to be ready in about three months' time.

Proposed Water-Works Transfer at Bridlington.—The Bridlington District Council have given the Water Company notice that, under the provisions of section 90 of the Bridlington Water Act, 1896, it is their desire to purchase the undertaking, and that they intend to ask for the consent of the Local Government Board thereto. The Company have, through their Solicitors, informed the Council that they are not willing sellers.

The Outbreak of Lead-Poisoning in Derbyshire.—Regarding the paragraph on this subject which was published in our issue for the 3rd ult., it is satisfactory to learn that there is a diminution in the number of cases of lead-poisoning requiring treatment. According to Dr. Mackintosh, the Medical Officer of Health to the Chesterfield Rural Sanitary Authority, his analysis of the water supplied to the villages in the Eckington district showed that, after the rains began to act on the lead pipes towards the end of September, it contained 0·84 grain of lead per gallon. This analysis was made on Oct. 6; and the result was the maximum point reached. Prompt measures were taken, by putting in a plentiful supply of limestone in the reservoir outlets, to reduce the quantity of lead in the water; and the last analysis—on Nov. 2—revealed a reduction to 0·65 grain per gallon. Acting on Dr. Mackintosh's advice, the Sanitary Authority have decided to substitute chalk for the limestone; but this cannot be done until filter-beds have been prepared. Then the Medical Officer expects to see a rapid decrease in the quantity of lead in solution.

The Woking Water and Gas Company will to-day remove their local office to Richmond Villas, Walton Street, Woking.

Messrs. C. & W. Walker, of Donnington, have just completed, at the works of the Bothwell and Uddingston Gas Company, an addition to the purifying plant, consisting of four boxes, each 20 feet square, with lifting apparatus for the covers, and one of Weck's patent centre-valves. The new purifiers are housed in a building 100 feet long by 40 feet wide. The plans for the whole were prepared by Mr. L. Hislop, the Company's Manager.

As mentioned elsewhere, Mr. Alfred Richards sold last Tuesday, by order of the Directors of the Aldershot Gas and Water Company, a number of their new issue of 5 per cent. preference shares. Those who were unsuccessful in obtaining any of the stock may be directed to the announcement in our advertisement columns of a further sale at the Mart next Tuesday. On the same occasion, Mr. Richards will, in accordance with instructions from the Directors of the Guildford Gas Company, offer to public competition £5000 of the Company's ordinary stock; being the first issue of new capital under their Act of last session. The sale will include some original stock of the Brighton and Hove Gas Company, and shares in the Great Yarmouth, Hampton Court, and West Ham Gas Companies.

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READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

ECONOMY IN PURIFICATION

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

TRAVELLER, with good connection among Gas Companies, is open to ENGAGEMENT on Jan. 1.
Address No. 2756, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A YOUNG, energetic Engineer, now employed by a successful Provincial Gas Company, would like to hear of an APPOINTMENT in which his abilities would be of more service, and his energies have more scope, than at present. Fully qualified, with excellent References, and knowledge of Electricity.
Address No. 2759, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MAIN and Service Layer wanted at once by a Suburban Gas Company.
Applications, stating Age, and Wages required, with Testimonials, to be addressed to No. 2757, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Draughtsman accustomed to designing Details of Gas-Works Plant, and having a good knowledge of Architecture.
State Age, References, and Wages required, to WEST'S GAS IMPROVEMENT COMPANY, LIMITED, Albion Iron-Works, Miles Platting, MANCHESTER.

WANTED, in a Suburban Gas-Works, a young Man as STOREKEEPER, and to attend to the weighing of Coal, &c. One acquainted with the reading of Indices of Meters and with a knowledge of Pipe, Fittings, &c., preferred.
Apply, in own Handwriting, stating present Employment, with References, to No. 2758, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement see p. 1050.]

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

SADLER & Co., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making. Kerosene, &c.
Correspondence invited.
Telegraphic Address: "Sadler, Middlesbrough."

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

REQUIRED, a young Man as DRAUGHTSMAN and GENERAL ASSISTANT in the Technical Office in London of a Foreign Gas Company. Hours, 9.30 a.m. to 5 p.m. Knowledge of French Language would be a recommendation.
Apply, stating Age, whether Candidate has had experience in Gas matters or in the preparation of Drawings of Gas Apparatus, and Salary required, to H.W.F., care of Davies and Co., 1, FINCH LANE, E.C.

WANTED, a Second-hand Meter, suitable for Small Works (3 or 4 inch Connections).
Send full Particulars to EDWARD JONES, New Mills, near STOCKPORT.

WANTED, immediately, particulars of the most simple and effective APPARATUS for ENRICHING COAL GAS with Liquid Hydrocarbons.
Apply, by letter, in the first place, to No. 2755, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS TAR and Ammoniacal Liquor Wanted.
Apply to JOSIAH HARDMAN, Milton, STAFFS.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating Price per ton and quantity, No. 2747, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CROYDON COMMERCIAL GAS COMPANY.

FOR SALE—
Two HORIZONTAL ENGINES, by F. Horne, of London, fitted with Air-Pumps, for use with Surface Condenser. Cylinders 18¾-inch Bore, and 22-inch Stroke.
Two HORIZONTAL ENGINES, by D. Millar, of London, 23-inch Stroke. Cylinders, one 12-inch, and one 11¼-inch, with Plunger Air-Pumps, and 4 ft. 6 in. Pulleys.
One EXHAUSTER for 50,000 cubic feet per hour, by Waller, of London, with 14-inch Inlet and Outlet Valves and Connections.
One EXHAUSTER, by Donkin, of London, 40,000 cubic feet per hour, with 16-inch Valves and Connections.
Two BYE-PASS GAS-GOVERNORS, complete.
One CORNISH BOILER, by Cochrane, Grove, and Co., 22 feet long by 6 feet diameter, with five Galloway Tubes, and all necessary Fittings, &c., fitted with Perret's Dust Furnace, with Vertical Engine, and Blower complete.
One COKE-CRUSHER, by Waller, of London.
Also the following VALVES:—
Twelve 16-inch Rack and Pinion Valves, by Donkin.
Two 12-inch Rack and Pinion Valves, with Columns and Hand-Rails.
One 10-inch Rack and Pinion Valve.
One 8-inch Rack and Pinion Valve.
All the above are in good condition, and may be seen on application to the ENGINEER, Gas-Works, Waddon, CROYDON.
Also at CARSHALTON—
One GASHOLDER 80 feet diameter.
One GASHOLDER 60 feet diameter.
Three PURIFIERS 12 feet square, with 12-inch Connections.
One Good's WASHER, with 12-inch Connections.
One HORIZONTAL ENGINE and EXHAUSTER.
A number of FIRE-CLAY RETORTS, 18 inches diameter, by 9 ft. 3 in long.
HYDRAULIC MAINS, FITTINGS, &c.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

GOODSON'S Patent Self-Acting Gas GOVERNORS and BURNERS.
For Illustrated Advertisement, see "JOURNAL" for Nov. 17, p. 988.
GOODSON AND Co., 213, Vauxhall Bridge Road, LONDON, S.W.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

In Paper Covers, Post Free 2s.

STEPHEN CARPENTER, late of the Bow Common Gas-Works, on the PURIFICATION OF COAL GAS BY LIME, &c., and the Method of Working Lime Purifiers so that the Lime may be used a second time, with a Description of a short Method of Working the Sulphur Test.
S. CARPENTER, "Ryde," Woodhouse Grove, East Ham, ESSEX; or of H. W. CARPENTER, 3, Bedford Villas, Carshalton, SURREY.

THE Competitive Proposals submitted for NEW GAS-WORKS AT MALMOE have now been adjudged by a Jury, consisting of the Chief Engineer at the Gas-Works of Stockholm, Mr. Ad. Ahlsell; the Director of the Gas-Works of Charlottenburg, Mr. Schimming; and the Director of the Gas-Works of the Danish Gas Company, Mr. F. Marshall.
The Jury have awarded Prizes to the following proposals: To the Signature "FUCK," the FIRST PRIZE; to the Signature "CONTRAST," the SECOND PRIZE; and to the Signature "GLUCK AUF," the THIRD PRIZE.
The participators in the Competitive trial whose proposals have not been rewarded will please to give their Names and Addresses, in order that their proposals may be returned. The Drawings cannot be forwarded until the 1st of March, 1897.
THE BOARD OF THE GAS-WORKS.
Malmoe, November, 1896. (G.A.M.) 7407.

SULPHURIC ACID for Sale (B. O. V. and R. O. V.) made from Spent Oxide.
The EXECUTORS of the Late JOSIAH HARDMAN, Chemical Works, Milton, STAFFS.

PURIFYING PLANT FOR SALE.

THE Directors of the Coatbridge Gas Company invite OFFERS for a set of four PURIFIERS, 16 feet square, with Lifting Apparatus, Centre-Valve, and 15-inch Connections. All in good working order.
Offers to be addressed to T. WILSON, Engineer, Gas-Works, COATBRIDGE.

COMPLETE GAS PLANT FOR SALE.

TO BE SOLD separately, or in one lot—
One large Double-Lift HOLDER, with Cast-Iron Tank, 46 ft. 6 in. diameter by 16 ft. deep, with Inlet and Outlet Pipes.
Two Double-Lift HOLDERS, 34 ft. 4 in. diameter outer, 32 ft. 10 in. inner, 14 ft. 3 in. deep, with Pipes, &c.
One GOVERNOR, SYPHON BOXES, VALVES, &c.
One STATION METER, with Valves (new), Braddock's make.
One Set of four PURIFIERS, 7 ft. square by 4 ft. deep, Walker's make, with Grids and one of their Centre-Valves, Connections, and Lifting Gear.
One TAR-PUMP and STORE BOILER.
One Eclipse WASHER-SCRUBBER, Laycock and Clapham, with Pulleys and Governor, erected in 1890.
One EXHAUSTER, with 12-inch Valves and Connections.
One Horizontal CONDENSER, with fourteen 4-inch Pipes, 18 ft. long, with Bye-Pass, Valves, and Connections.
Twenty RETORT MOUTHPIECES, with Lids and Duplicates, Dip, Ascension, and Bridge Pipes, Hydraulic Main and Valve, Fire-Doors, Buckstaves, and Tie-Rods.
12-inch and 8-inch MAINS, at per ton.
12-inch VALVES, at each.
For further Particulars and Prices, apply to H. I. WILLIAMS AND Co., Kidsgrove, STOKE-ON-TRENT.

OIL-GAS BENZOL for Enriching Coal Gas. A few Thousand Gallons to dispose of. Apply, by letter, in the first place, to No. 2714, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Plant, both new and second-hand, ready for delivery, including Retort-Fittings, Condensers, Exhausters, Scrubbers, Purifiers, Meter, Governor, and Gasholder. **Inquire Price and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

ROCHDALE CORPORATION.

TO IRONFOUNDERS AND OTHERS.

THE Gas Committee of the above Corporation invite TENDERS for the supply of such quantities of CAST-IRON PIPES and SPECIALS of various sizes as they may require during a period of Twelve Months from the 1st of January, 1897.

Forms of Tender and any further Particulars may be obtained on application to Mr. T. Banbury Ball, the Manager at the Gas-Works.

Tenders, endorsed "Pipes," stating Price per ton for each size of Pipes and Specials, delivered at the Rochdale Station, must be sent in to me not later than noon on Wednesday, the 9th of December, 1896.

Contractors who intend to sub-let part of their contracts must forward with their original tender a list of the Names of their Sub-Contractors.

By order,
JAMES LEACH,
Deputy Town Clerk.

Town Hall, Rochdale,
Nov. 28, 1896.

ROCHDALE CORPORATION.

TO RETORT MAKERS AND OTHERS.

THE Gas Committee of the above Corporation invite TENDERS for the supply of such quantities of RETORTS and other FIRE-CLAY GOODS as may be required during the Year ending the 31st of December, 1897.

Forms of Tender and any further Information may be obtained on application to Mr. T. Banbury Ball, the Manager at the Gas-Works.

Tenders, endorsed "Fire-Clay Goods," must be sent to me not later than noon on Wednesday, the 9th of December, 1896.

Contractors who intend to sub-let part of their contracts must forward with their original tenders a list of the Names of their Sub-Contractors.

By order,
JAMES LEACH,
Deputy Town Clerk.

Town Hall, Rochdale,
Nov. 28, 1896.

BRISTOL GAS COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at all or either of their three Stations during a period of One, Two, or Three Years, commencing on the 1st day of January, 1897.

The annual quantities of Tar produced at each of the Stations at present are, approximately, as follows:—

Avon Street	650,000 gallons.
Canons' Marsh.	550,000 ,,
Stapleton	650,000 ,,

Further Particulars, with Forms of Tender, may be obtained on application to the undersigned, to whom also tenders sealed, and endorsed "Tender for Tar," must be delivered not later than Wednesday, the 9th day of December prox.

JOHN PHILLIPS,
Secretary.

Chief Offices: Canons' Marsh, Bristol,
Nov. 26, 1896.

SHEFFIELD UNITED GASLIGHT COMPANY.

PURIFIERS.
TO ENGINEERS, IRONFOUNDERS, &c.

THE Directors of this Company invite TENDERS for the supply and erection of Six PURIFIERS, 74 feet by 40 feet, together with internal Fittings, Covers, and Connections complete for the Purifying-House at their Grimesthorpe Station.

Drawings and Specification may be seen, and Bill of Quantities with Form of Tender obtained, on or after the 19th inst., on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bonâ-fide* tender.

Sealed tenders, endorsed "Tender for Purifiers," to be delivered by post to the undersigned at the Company's Offices not later than the first post on Saturday, the 5th day of December.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Nov. 14, 1896.

SHEFFIELD UNITED GASLIGHT COMPANY.

ELEVATORS AND CONVEYORS.

THE Directors of this Company invite designs with TENDERS for the supply and erection of the necessary MACHINERY for discharging Coal from Railway Waggons, and breaking, elevating, and distributing same within the Coal-Stores at their Grimesthorpe Station.

Particulars with Drawings will be supplied on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bonâ-fide* tender.

Sealed tenders, endorsed "Tender for Coal Distributing Machinery," to be delivered by post to the undersigned not later than the first post on Saturday, Dec. 19 next.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
Nov. 20, 1896.

THE Corporation of Liverpool have FOR DISPOSAL a number of HIGH-POWER LAMPS, COLUMNS, and BURNERS, in first-rate condition, and of handsome design, suitable for Refuges, principal Streets, or Promenades—varying between 50 and 300 Candle Power.

Drawings and full Particulars can be obtained on application to Mr. C. R. Bellamy, Superintendent of the Gas Department, Hood Street, Liverpool; and tenders for the purchase of the whole or any number of the Lamps and Columns should be forwarded to me on or before the 19th of December next.

HARCOURT E. CLARE,
Town Clerk.

Municipal Offices, Dale Street,
Liverpool, Nov. 26, 1896.

SMETHWICK GAS-WORKS.

TENDERS FOR RETORTS, &c.

THE Gas Committee of the Urban District Council of Smethwick invite TENDERS for their requirements of FIRE-CLAY RETORTS, FIRE-BRICKS, and FIRE-CLAY during the ensuing Twelve Months.

Particulars may be obtained from Mr. B. W. Smith, Engineer, at the Gas-Works.

Tenders to be endorsed and addressed to the Chairman of the Gas Committee, and to be delivered to the undersigned not later than the 22nd of December next.

By order,
W. J. STURGES,
Secretary.

Gas Offices, Public Buildings,
Smethwick, Nov. 25, 1896.

BOROUGH OF STOKE-UPON-TRENT.

(GAS DEPARTMENT.)

TENDERS FOR STEEL TANK AND GASHOLDER.

THE Gas Committee of the Stoke-upon- Trent Corporation invite TENDERS for the construction of a STEEL TANK and THREE-LIFT HOLDER.

Drawings and Specifications may be seen, and Bill of Quantities obtained, on or after Dec. 3, on application to the Engineer, Mr. William Prince, on payment of 10s. 6d., not returnable.

Sealed tenders, endorsed "Tender for Gasholder," to be delivered not later than the first post on Thursday morning, Dec. 10, 1896, addressed: F. Geen, Esq., Chairman, Gas-Works, Stoke-upon-Trent.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
J. B. ASHWELL,
Town Clerk.

CORPORATION OF LEICESTER.

CAST-IRON PIPE CONTRACT.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of the necessary CAST-IRON PIPES and CONNECTIONS, from 2 inches to 24 inches in diameter, required during the Twelve Months ending the 31st of December, 1897.

Specification and Form of Tender to be obtained from the Engineer.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock on Saturday, Dec. 12, 1896.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Nov. 27, 1896.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCKS and BONDS, WILL BE CLOSED at Four o'clock p.m., on Thursday, the 10th prox., for the Half Year ending on the 31st prox., and will be RE-OPENED on the morning of Friday, the 11th prox.

The Interest for the Half Year will be payable on the 1st of January next, to the Proprietors registered on the closing of the Books.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Nov. 28, 1896.

KENT WATER-WORKS COMPANY.

SALE BY TENDER OF £20,000 FIVE PER CENT. DEBENTURE STOCK.

MINIMUM PRICE, £175 PER CENT.

THE Directors invite Tenders for the Issue on Sale to the highest Bidders of £20,000 of FIVE PER CENT. PERPETUAL DEBENTURE STOCK, authorized to be raised under the Kent Water-Works Act, 1877.

The Ordinary Capital of the Company raised is £868,000, which comprises £708,000 Capital Stock, on which the Dividend for the last Half Year was at the rate of 10 per cent. per annum, with a further Dividend of 2 per cent. per annum on account of back Dividends, and £160,000 new Capital Stock, on which the full Dividend of 7 per cent has been paid since its issue.

The Mortgage Capital raised is £42,000, and the Debenture Stock raised is £20,000.

Tenders must be sent in on or before Tuesday, the 8th of December.

Forms of Tender, with Particulars and Conditions, may be obtained on application to the Secretary.

Tenders below the minimum price of £175 for each £100 of Stock cannot be accepted.

By order of the Directors,
ALEXANDER DICKSON,
Secretary of the Company.

Kent Water-Works Offices,
Mill Lane, Deptford, S.E.,
Nov. 18, 1896.

EAST LONDON WATER-WORKS COMPANY.

ISSUE OF £165,000 THREE PER CENT. DEBENTURE STOCK.

MINIMUM PRICE, PAR.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above ISSUE (being the third portion of the £500,000 Debenture Stock, created under the East London Water-Works Company's Act of 1894), bearing Interest at 3 per cent. per annum, less Income-Tax, and redeemable after the expiration of 25 Years from the date of issue, subject to six months' notice being given by the Company.

Minimum Price, Par.

Tenders must be delivered at the Company's Offices, St. Helen's Place, Bishopsgate, E.C., not later than Eleven a.m., on Thursday, the 10th day of December ensuing.

Particulars and Conditions, together with Form of Tender, may be obtained at the said Offices, or will be forwarded on application.

By order of the Court of Directors,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, Bishopsgate, E.C.,
Nov. 5, 1896.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

SALE DEC. 8, 1896.

ALDERSHOT GAS AND WATER COMPANY.
NEW ISSUE OF 200 £10 FIVE PER CENT. PREFERENCE SHARES.

MR. ALFRED RICHARDS is instructed by the Directors to SELL the above BY AUCTION at the Mart, Tokenhouse Yard, E.C., on Tuesday, the 8th of December, at Two o'clock precisely, in lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

BRIGHTON AND HOVE GENERAL GAS COMPANY.
£200 ORIGINAL STOCK.
To be SOLD BY AUCTION by

MR. ALFRED RICHARDS on the above date.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

GUILDFORD GASLIGHT AND COKE COMPANY.
NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS is instructed by the Directors to SELL on the above date £5000 of ORDINARY STOCK in the Guildford Gaslight and Coke Company, ranking for a Standard Dividend of 5 per cent.

Particulars of the SECRETARY at the Offices, GUILDFORD; of R. SPARKES, Esq., Solicitor, GUILDFORD; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

HAMPTON COURT GAS COMPANY.
TWENTY-ONE £10 "A" AND "B" SHARES.
To be SOLD BY AUCTION by

MR. ALFRED RICHARDS on the above date.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

WEST HAM GAS COMPANY.
183 £10 SHARES.
To be SOLD BY AUCTION by

MR. ALFRED RICHARDS at the Mart, E.C., on Tuesday, Dec. 8, at Two o'clock.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

GREAT YARMOUTH GAS COMPANY.

MR. ALFRED RICHARDS will Sell on the above date 20 £30 SHARES in the Great Yarmouth Gas Company, paying a Dividend of 7½ per cent.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

TAR AND LIQUOR PURCHASED.

MAJOR & CO., Ltd.,

SUCCESSORS TO

JOHN CLARKSON MAJOR,

(Established 1851)

Tar Distillers and Manufacturing Chemists,

HULL & WOLVERHAMPTON.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.

8 Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,

165, QUEEN VICTORIA STREET, E.C.,

And at STROUD, GLOUCESTERSHIRE.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED

— *v* —

"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

— *v.* —

"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT WHETHER

MAKERS,
WHOLESALE DEALERS,
RETAILERS,
or
USERS.

Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

FAITHFULL & OWEN,

11, Victoria Street

Westminster.

Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash . . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

THE NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING COMPANY, LIMITED.

THE SUNLIGHT COMPANY having finally beaten the Welsbach Company in the Law Courts, notwithstanding the misleading statements which are being advertised, the Legal Position of its Mantle is now

ESTABLISHED BEYOND ALL QUESTION.

Mr. JUSTICE WILLS says in his Judgment: "No use is made by the Defendants (the Sunlight Company) of any of the rare earths; and their choice of substances, and their method of applying the illuminants, appear to me to be as wide asunder as the poles from those contemplated by Welsbach."

Therefore any interference with our Customers by the Incandescent Company in their use of our Mantles, either on our Burners *or on theirs*, should be promptly reported. **It will at once be summarily dealt with by us, without cost to our Customers.**

THE SUNLIGHT COMPANY are owners of the RAWSON PROCESS for STIFFENING MANTLES for TRANSPORT. An action against the Welsbach Company for Infringement of this Patent will shortly be heard, and, we are advised, will establish the validity of the Patent, and render all users of their Mantles liable to proceedings at law, and all stocks of such Mantles liable to be destroyed by order of the Court.

THE SUNLIGHT MANTLE GIVES A SOFT MELLOW LIGHT, VERY AGREEABLE TO THE EYESIGHT, AND HEIGHTENS THE DECORATIVE EFFECT OF PLEASANT COLOURS. WE ARE PREPARED TO MAINTAIN ALL BURNERS FITTED BY OURSELVES AT A VERY LOW PRICE PER ANNUM; AND SPECIAL TERMS FOR RENEWAL MANTLES WILL ALSO BE MADE TO THOSE WHO PREFER TO DO SO THEMSELVES.

THE NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING COMPANY, LIMITED,

33 & 34, SHOE LANE, LONDON, E.C.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD ST., E.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

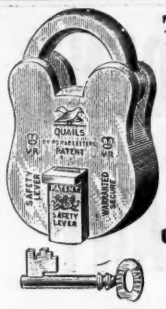
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.



The Cheapest House in the Trade for

LEVER LOCKS

FOR

GAS-METERS.

Joseph Oakley & Co.

Excelsior Works,

WILLENHALL.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500 Cubic Feet.
Illuminating Power	16·9 Candles.
Coke	66·7 Coke.
Sulphur	0·86 Sulphur.
Ash	2·04 Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,

FITTER.

ARMSTRONG'S

PATENT

CANDLE SAFETY LAMPS.

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

12, JOHN STREET, ADELPHI, LONDON, W.C.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

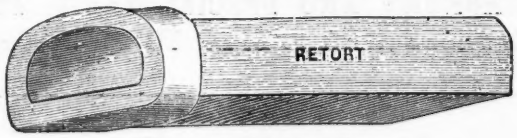
Near BARNSLEY, SOUTH YORKSHIRE.

PHILADELPHIA EXHIBITION, 1876.

ALSO SILVER MEDAL, PARIS.

The Highest Award for Gas-Retorts and other Goods in Fire-Clay has been awarded to KING BROTHERS for their Goods made from their renowned Stourbridge Fire-Clay.

KING BROTHERS,



Proprietors of

STOURBRIDGE CLAYS,

Manufacturers of

Fire-Bricks, Tank Blocks, Glass-House Bricks and Pots, Gas-Retorts, Crucibles in Clay and Plumbago, Gas-Oven Bricks, Bricks for Regenerator Furnaces and Hot-Air Stoves.

STOURBRIDGE, ENGLAND.

CRUCIBLE MANUFACTORY, 46, PENN STREET, CURZON STREET, BIRMINGHAM.

N.B.—Gas, Blast-Furnace, and Glass-House Bricks and Glass-House Pots always in Stock, or made on the Shortest Notice.

JOHN BROWN & CO., LTD., SHEFFIELD.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

THE SILICA FIRE-BRICK COMPANY,

OUGHTYBRIDGE, NEAR SHEFFIELD.

Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

MANUFACTURERS OF

SILICA FIRE-BRICKS

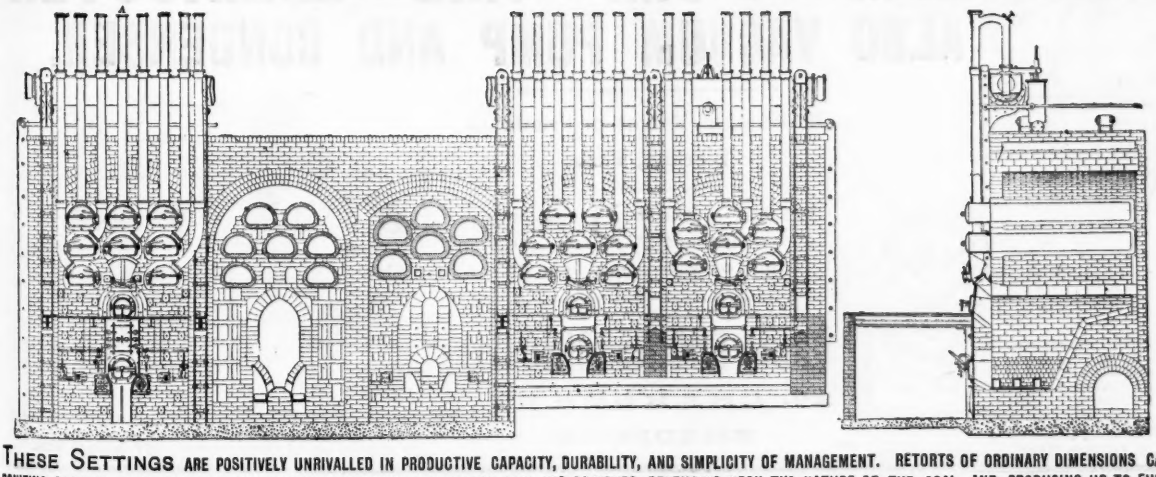
(TRADE MARK "SILICA")

Specially adapted for Siemens-Martin Gas-Furnaces; also for Gas, Copper, Iron, Steel, and other Furnaces where intense heat is required.

BESSEMER GANNISTER, STEEL-FURNACE GANNISTER, COPPER-FURNACE GANNISTER, IRONFOUNDERS' CUPOLA SAND, FINE-SETTING SILICA CEMENT, STEEL MOULDERS' COMPOSITION.

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.

Further Information and Pamphlets from Principal Agent.

JAMES MILNE & SON, LTD.,

GAS ENGINEERS,

MILTON HOUSE WORKS, EDINBURGH.

LONDON. — GLASGOW. — LEEDS.

D. HULETT & CO., LTD.

55 & 56, High Holborn, London.

GAS SERVICE CLEANSERS.

LAMP TORCHES.

DRY GAS-METER MAKERS.

WROUGHT-IRON TUBES & FITTINGS.

STREET LAMPS & POSTS.

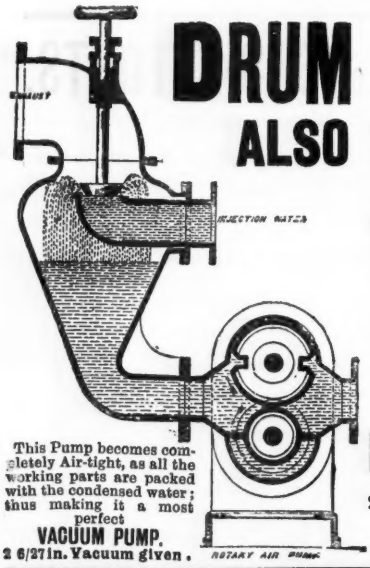
PRICE LISTS ON APPLICATION.

"The Force of the Piston Pump with the Capacity of the Centrifugal combined."

JOHNSON'S PATENT

DRUM PUMP AND EXHAUSTER

ALSO VACUUM PUMP AND CONDENSER.



This Pump becomes completely Air-tight, as all the working parts are packed with the condensed water; thus making it a most perfect

VACUUM PUMP.

26/27in. Vacuum given.

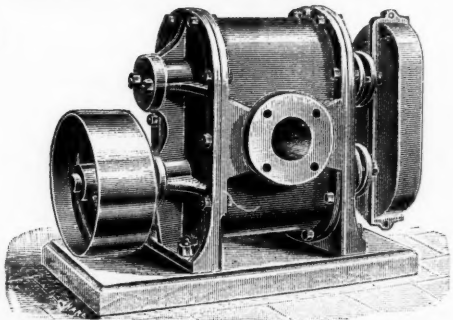
No Priming, Valves, or Frictional Working Parts.

The Pump of the future for quickly and economically moving large Bodies of Water, Semi-fluid, &c.

DRUM ENGINEERING Co.

27, CHARLES ST.,

BRADFORD.



Blowers and Exhausters guaranteed, even at a slow speed, to give a working pressure of 2 lbs. and upwards, and this without losing power by creating frictional Heat.

MOBBERLEY & PERRY

STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c., &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

Contractors for the erection of Retort-Benches complete.

London Agents:

BALE & HARDY,

Gas Engineers and Contractors,

BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brighton	1,500,000 Cub. Ft.
Belfast	1,700,000 ,,	Preston	1,500,000 ,,
Glasgow	300,000 ,,	Southport	750,000 ,,
Brussels	700,000 ,,	Bath	1,000,000 ,,
Liverpool	3,500,000 ,,	New York	1,200,000 ,,
Tottenham	750,000 ,,	Newburgh, N.Y.	350,000 ,,
Santiago	400,000 ,,	Tottenham (Second Contract)	750,000 ,,
Swansea	750,000 ,,	St. Joseph, Mo.	750,000 ,,
		Brussels (Second Contract)	700,000 ,,

And have now under Contract:—

Belfast (Second Contract)	4,500,000 Cub. Ft.	Stockport	500,000 Cub. Ft.
Shanghai	225,000 ,,	Norwich	1,000,000 ,,
Winchester	200,000 ,,	Guildford	350,000 ,,
Hoylake	125,000 ,,	Syracuse, N.Y.	850,000 ,,
Manchester	3,000,000 ,,	Bordentown, N.J.	125,000 ,,
Holyoke, Mass.	600,000 ,,	Lea Bridge	350,000 ,,
Edinburgh	2,000,000 ,,	Newburgh, N.Y. (Second Contract)	250,000 ,,
Stockton-on-Tees	500,000 ,,	Coventry	600,000 ,,

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

9, Victoria Street, London, S.W.

Telegrams: "EPISTOLARY, LONDON."

United States Office, 64, Broadway, New York.

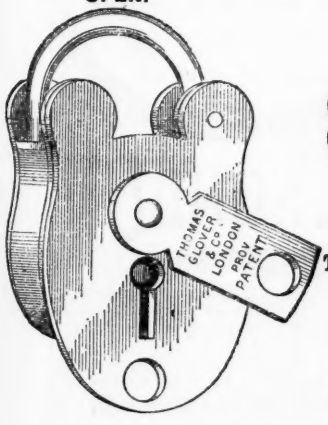
[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

OPEN.



THOMAS GLOVER & CO.'S

PATENT

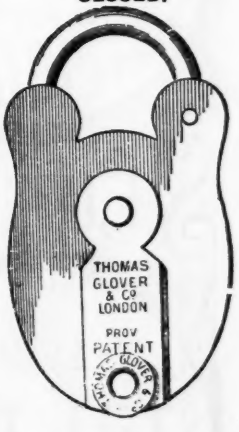
SECURE PADLOCK

Prevents Tampering with the

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

CLOSED.



Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC"*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

R. & A. MAIN,

GAS COOKING AND HEATING STOVES,

92, ALDERSGATE STREET, KINNING PARK,

LONDON, E.C., & GLASGOW.

ALDER AND MACKAY,

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.

ORIGINAL MANUFACTURERS OF DRY METERS IN CAST-IRON CASES.

STATION METERS, EXPERIMENTAL METERS, PHOTOMETERS, & PRESSURE-GAUGES, &c.

Results of Tests of Dry Gas-Meters (Section III.) of the Glasgow Philosophical Society's Gas Exhibition, as per London "Gas Journal," May 10, 1881.

	ALDER & MACKAY.	W. & B. COWAN.	G. GLOVER & Co.	JAMES KEITH.	D. B. PEEBLES & Co.
Total of Fast Tests . .	47·2 ..	6·9 ..	33·6 ..	62·3 ..	53·7
Total of Slow Tests . .	25·3 ..	117·4 ..	43·1 ..	31·4 ..	38·5
	72·5 ..	124·3 ..	76·7 ..	93·7 ..	92·2

Descriptive Circulars, Price Lists, and Full Particulars forwarded on application.

NEW GRANGE WORKS, EDINBURGH.

TANKS ROOFS

CUTLERS PATENT TUBULAR GAS CONDENSER SUITABLE FOR GASWORKS OF ALL SIZES, AND FOR ANY CLIMATE OVER 100 ERECTED

MAKERS OF GASHOLDERS OF EVERY SIZE AND TYPE

HUNT'S PATENT WASHER. IS THE ONLY APPARATUS NECESSARY BETWEEN THE CONDENSER & PURIFIERS. IT REQUIRES NO MOTIVE POWER

TELEGRAMS RETORTUS LONDON

NATIONAL TELEPHONE 5059.

S. CUTLER & SONS, MILLWALL LONDON

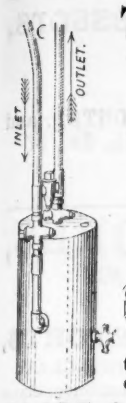
FOREIGN AGENTS. COLONIAL AGENTS

A SPECIALTY STEEL TANKS FOR GASHOLDERS AND OIL STORAGE.

IMPROVED SYSTEM OF CARBURETTED WATER-GAS PLANT PARTICULARS ON APPLICATION.

CUTLER'S FREEZING PREVENTER IS THE BEST APPLIANCE FOR PREVENTING FORMATION OF ICE IN GASHOLDER CUPS. IT IS IN USE AT MANY IMPORTANT WORKS IN ENGLAND, GERMANY, AUSTRIA, AND AMERICA

ELECTRIC FITTINGS DYNAMOS MOTORS.



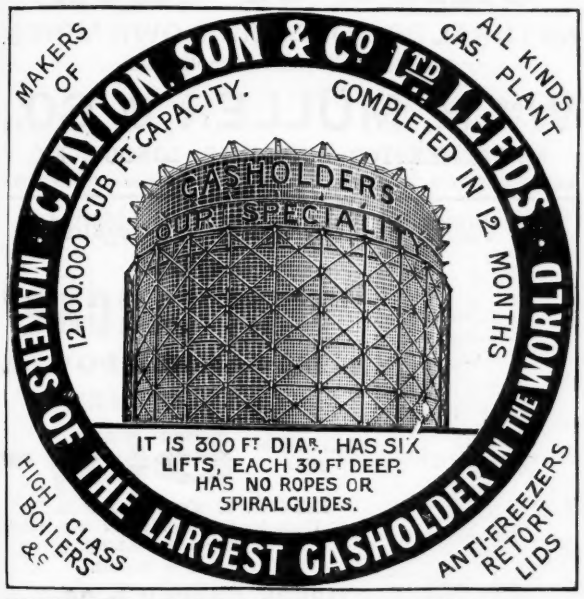
THE "GLOBE" PATENT
GAS ENRICHER.

IMPROVED LIGHT AND REDUCED GAS BILLS.

ESTIMATES AND TERMS ON APPLICATION.

When writing for Estimates, please state number of Meters in use, with the diameter of the Outlet-Pipe. Also the quantity and sizes of the ordinary Burners served by each Meter.

GLOBE GAS ENRICHER SYNDICATE, LTD.,
81, HIGH HOLBORN, LONDON, W.C.


MAKERS OF
ALL KINDS GAS PLANT
CLAYTON, SON & Co LTD LEEDS.
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
A SPECIALITY
IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

London Office: 60, QUEEN VICTORIA STREET, E.C.

Telegraphic Addresses: "GAS, LEEDS," "ECLARAGE, LONDON."

INCANDESCENT GAS LIGHTING

SMOKELESS GLOBE-CHIMNEY.

CONSUMES ITS OWN SMOKE, AND INCREASES THE LIFE OF MANTLES.

No Chimney Required.

Prices 2s. 6d. to 4s. 0d.
List on Application.

J. ORMEROD,
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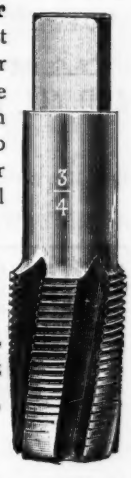

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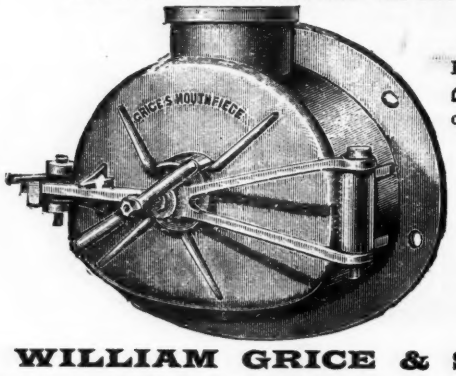

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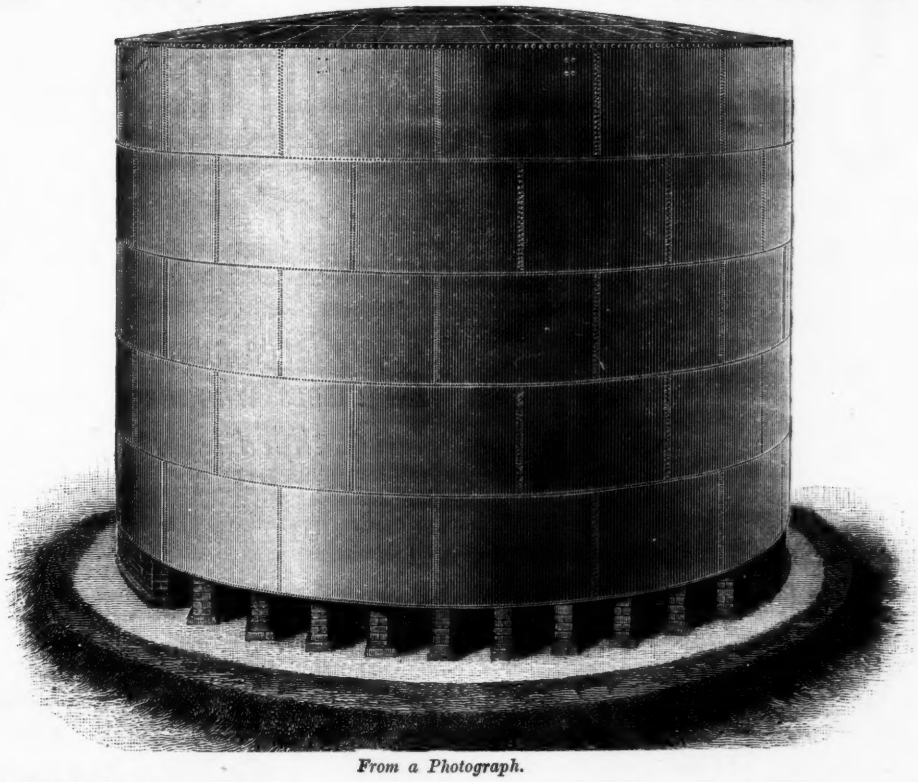

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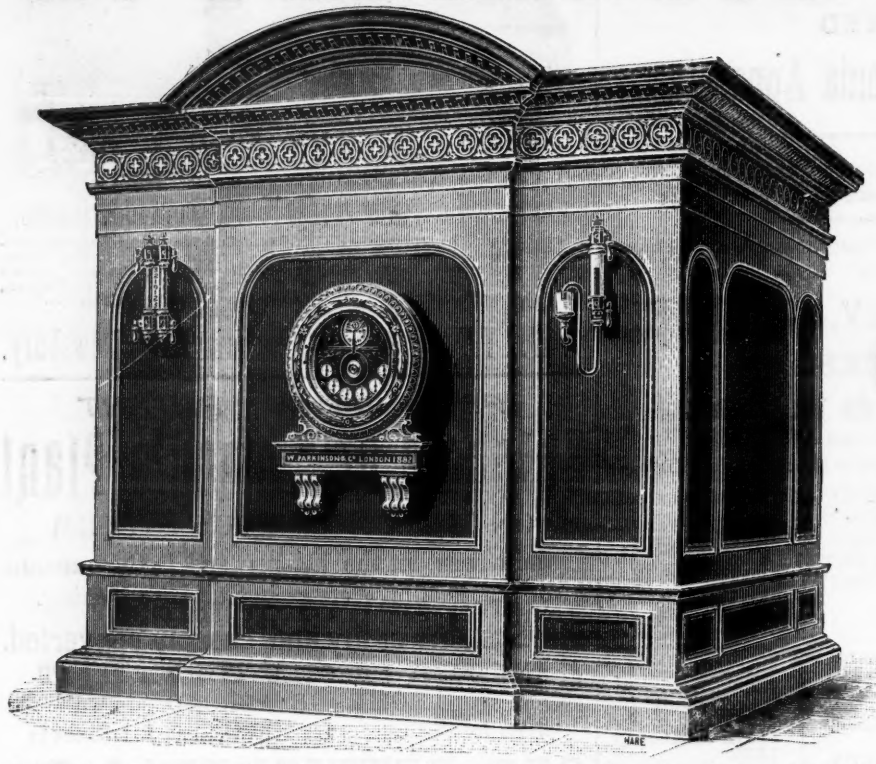

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[See also Advt., p. 1056.

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